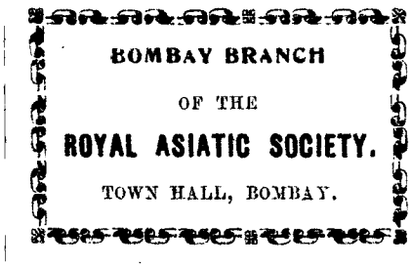
Crop Experiments
Bombay
1884-85 & 1893-94
(Except 1887-88 & 1888-89)

00133393



Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020

133393
a

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1884-85.

[*Price—7 Annas.*]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1884-85.

B 1257—a

CONTENTS.

	Pages.
I.—Forwarding Letter	... 1—2
II.—Analysis—	
Northern Division	... 3—6
Central Division	... 7—12
Southern Division	...13—19
III.—Tabular Summaries—	
Northern Division	...23—31
Central Division	...33—41
Southern Division	...43—47
IV.—Appendices—	
A.—Memo. of points for the guidance of Experimenters	...51—52
B.—Special Experiment made by Mr. R. K. Vaidya ...	...53—54
C.— Do. do. Mr. R. A. Lamb ...	...55—65
D.— Do. do. Mr. J. Fairlie Muir ...	...66—70
E.—Experiments made by Mr. W. S. Price ...	...71—73
F.— Do. Mr. J. J. Heaton ...	...74—82
G.—Memo. on the cultivation of Betel Vine... ...	...83—91

No. 889 of 1886.

From

The DIRECTOR of AGRICULTURE,
Bombay;

To

The SECRETARY to GOVERNMENT,
Revenue Department, Bombay.

Poona, dated 13th April 1886.

Sir,

I regret the delay that has arisen in submitting the analysis of crop experiments made in 1884-85. The compilation of the preceding year was placed in the hands of experimenters before the commencement of the fair season, in order that the new experiments might be made with the full knowledge of the results of the previous season. This course was impossible this year owing to the greatly increased calls on my time. Moreover, as owing to the financial pressure Government saw fit to order a temporary discontinuance of experiments, there was less reason for expediting the publication.

2. The experiments now submitted have been reported for the first time in the form sanctioned by Government Resolution No. 3289, dated 22nd April 1884. On the whole, I think that the standard of value has been raised by the adoption of the revised form. The details regarding the crops experimented on are fuller, and there is an absence of the former frequent omission of some of the facts which are necessary to explain the results shown. The form has proved suitable and requires no modification. But in order to exhibit the results in a more succinct and readable manner I have exhibited the results in an abreviated statement, taking care that in the remarks column no important fact bearing on the result should be neglected.

3. I have followed the plan adopted last year, which I judge to have been approved by Government, of rejecting experiments which do not reach a fair standard of accuracy and trustworthiness, though in every case I have shown special reason for the rejection. My only fear in this respect is that it may be supposed by some readers that rejection is resorted to more freely when the reported results appear to indicate over-assessment. I would, therefore, clearly state that I have in no way been influenced by such consideration—a fact which will be apparent to a close student of the compilation.

4. I think that Government will be satisfied that the subject of crop experiments has received fair attention during the year under report. The compilation includes some experiments of very high value. I would especially call attention to the excellent work done by Messrs. Heaton and Fairlie Muir in the Southern, Mr. Lamb in the Central, and Messrs. A'darji Jivanji and R. K. Vaidya in the Northern Division. The reports of these officers are fully recorded. They give proof of the value of the work to Revenue officers, and show how essential to such officers is a proper appreciation of the conditions of cultivation and its modes in various tracts, when it is considered that on Revenue officers devolves the duty of supervising and checking the registration of crops in the villages, of checking the estimates of yield in the tálukás, and of studying the incidence of the assessment levied on the land.

5. The following statement shows the extent of the work done compared with that of the previous two years:—

Division.	1882-83.		1883-84.		1884-85.	
	Special.	Ordinary.	Special.	Ordinary.	Special.	Ordinary.
Northern	2	37	6	23	2	36
Central	5	55	11	19	4	37
Southern	3	75	4	41	2	31
Total ...	10	167	21	83	8	104

The distinction between special and ordinary experiments is not yet understood by certain officers; therefore the classification in the above statement is not precise. In the enumeration are included rejected experiments.

In my last year's report I called special attention to the results given by the Násik experimenters and showed how utterly irreconcileable they are with the figures of the formulæ. I asked that special orders for the conduct of a large number of ordinary experiments on staple crops might be given. The Commissioner, C. D., supported my request. But again excessively low yields are reported. I have no evidence that the formulæ were ever consulted. I can only repeat my request. A case for special enquiry is fully made out. If the results reported are correct the formulæ are egregiously incorrect.

6. Little attention has been paid to the special subjects for observation enumerated in paragraph 15 of the Standing Orders on crop experiments (G. R. No. 3289, dated 22nd April 1884).

7. As regards the calculation of the cost of cultivation further experience leads me to ask for a modification of the standing order (Rule 4 of Ordinary Experiments) that the information as regards the various acts of husbandry should be given in an appended memorandum and that the cost should be calculated in my office. I am constrained to ask that this order may be modified. It is impossible for me to calculate the cost on a vague enumeration of the number of ploughings and the like. If experimenters go sufficiently carefully into the matter it can add little to their labour to complete the calculation showing full details. I would ask that except the first two lines of Rule 4 the wording may be altered as follows :—

"Columns 28 and 29 of the form will be left blank in ordinary experiments, unless the experimenter finds leisure to deal fully with the cost of cultivation. When, however, the cost is estimated, the full details of the calculation should invariably be shown in an appended memorandum. In order that the details may be complete the following main heads are indicated."

The cost of cultivation has always been *the* difficulty of crop experiments. It is not an easy subject. There are some officers whose estimates are of great value, but in the majority of cases the labour expended is expended in vain. I think that Government is likely to secure more interest in the subject of crop experiments and more really trustworthy estimates of the cost of cultivation if the calculation is left to the option of experimenters.

I would also request the sanction of Government to the addition of the rule printed below (pages 8 and 9) to the Standing Orders on Crop Experiments under "Explanations."

8. I append a short memorandum showing the points on which the experiments indicate that further elucidation is necessary (Appendix A.).

9. Personally I have devoted all available time to the conduct of crop experiments connected with the ráb question. My notes on the ráb experiments form the subject of a separate report to Government.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Director of Agriculture.

ANALYSIS OF CROP EXPERIMENTS.—NORTHERN DIVISION, 1884-85.

Ahmedabad.

Mr. W. Allen, 1st Assistant Collector.

Mr. Allen contributes 5 tests, made according to the rules, but evidently not made *con amore* and therefore not of much value. I agree with Mr. Allen that "the statements of ordinary cultivators as to cost of cultivation are very untrustworthy". Of course they are. My experience is that immense patience is called for and even if exercised is not always rewarded. The cost of cultivation is extremely difficult.

Mr. A. F. Maconachie, Assistant Collector.

Mr. Maconachie submits 6 ordinary and one special experiments, the figured results of which are incorporated in the tabular statement. Last year this officer made a series of experiments on cotton. Now he has confined his attention to wheat. As ordinary experiments the results are valuable, though a little more comment would have been appreciated. The season favoured dry-crop wheat far more than irrigated varieties. This result seems to be corroborated by Mr. Allen's figures (Experiment No. 4.)

Mr. Maconachie's special experiment is far from satisfactory. I reported an attempt by the same officer last year with the object of assisting him. I shall now only notice shortly the character of the errors and shortcomings in the new venture. A holding of 104½ acres was selected (too large, far above the average holding). It contained 59¾ acres of cotton, 28⅛ under jowári and 9 under dry-crop wheat. With his experience gained last year in cotton and this year in wheat and jowári the selection was good. No count however seems to have been taken of the assessment, or the peculiar conditions of the various fields making up the large areas under estimation. But the cotton was in a lump taken as a 10-anna crop, and the jowári as a 4-anna one. A 10-anna yield of cotton was taken at 1,630 lbs. seed cotton per acre. A reference to Mr. Maconachie's experiments last year will show that he found a 12-anna crop to be 640 lbs. and a 10-anna crop to be 440 lbs. seed cotton in this and the adjoining táluka. The cotton this year, as appears from the remarks made, was much damaged by excessive rain and no word is given to explain that the conditions of the selected holding were different from the generality. Last year's experiments again show that the proportion of clean cotton to seed was as 1 : 3, yet in the calculation of the experiment under review the proportion is taken as 2 : 1. With these errors Mr. Maconachie finds the value of the cotton on his selected holding as follows:—

		Rs.	a.	p.
1,624⅔ Mans (40 lbs. each)	clean cotton...	12,591	13	0
812⅓ „	„ seed ...	913	12	0

No wonder that his final deduction is as follows:—"The surplus after paying Government assessment is Rs. 12,995-8-0—a very handsome one which shows the advantage a large farmer has over a small one"!!

The cost of cultivation is as erroneously calculated. The food requirements of 13 adults and 6 children are estimated as costing Rs. 233, while the feed of 10 bullocks (exclusive of the jowári and wheat straw) is taken to cost Rs. 300.

Mr. Edalji Dosábhái, District Deputy Collector.

Mr. Edalji sends in 4 good ordinary experiments. His remarks as regards the object of growing *sundia* jowári for fodder principally, are interesting and explain to me, who am not acquainted with the agriculture of Gujarát, the estimate made for instance by Mr. P. H. Dastur last year (*vide* Crop Experiment Report for 1883-84, p. 8). This is a point of great importance in estimating the food supply of the year from the formulæ.

Kaira.

Mr. R. M. Kennedy, Assistant Collector.

Mr. R. M. Kennedy has experimented on tobacco and wheat, following early rice. Both tests appear to have been carefully made, and are placed with confidence on the record, with descriptive and explanatory notes.

Mr. Kennedy sent in a special experiment which he requested to be allowed to withdraw when the Collector pointed out that the standing orders had not been observed. The holding comprized rice, followed in part by wheat, jowári, bájri and tur. On all sides of the field the headlands were under grass, on one side a considerable area being devoted to this product which Mr. Kennedy says is very valuable, fetching Rs. 3 per 100 bundles. No less than 24 gunthas in the field of 3 acres were kept for grass. The fault of the experiment was that the experimenter was only able to make actual tests of two insignificant crops of the holding. What they were is not stated. The other details for the experiment were obtained from enquiry. As these were really the details regarding the chief crops, I think that Mr. Kennedy was wise to withdraw the report. The method of the experiment was otherwise quite correct. Mr. Kennedy argues that Assistant Collectors cannot deal with special experiments. Of course it is impossible generally for an Assistant Collector to pay 3 or 4 visits to the same locality, but special experiments can be carried out without repeated visits. He further remarks that it is "impossible, and presumably not the wish of Government, that a cultivator should be harried or hindered in his field operations to suit the convenience of an Assistant Collector". This remark is hardly called for. The cultivator is recouped for whatever loss of time the experiment entails, by not having to pay for the reaping of the test areas, and in my experience he has been generally interested in the experiment. Admittedly Mr. Kennedy had to deal with a surly fellow. This contingency was foreseen by the Survey Commissioner when he gave the advice which is incorporated in clause 6 of the standing orders on special experiments.

Mr. P. H. Dastur, District Deputy Collector.

Mr. P. H. Dastur contributes 4 ordinary experiments on late crops of wheat and gram, following either rice or kodra of the early season. The details are not clear and the report is marred by inaccuracy of calculation. No information whatever is given of the character of the early crop. But the incidences of column 10 are, it must be noted, calculated on the yield of the 2nd crop only. The excessive moisture did more harm in black than in the light *gorádu* soil.

Panch Maha'ls.

The experiments of this district made by Mr. A'darji Jivanji and his successor Mr. R. K. Vaidya, District Deputy Collectors, are extremely valuable and instructive. The former selected three fields in one village to estimate the yield of maize, the staple crop of the locality. The latter carrying out his predecessor's plan, made experiments with the two chief late crops—wheat and gram—which are secured after the maize has been reaped. Thus, instead of having to consider the incidence of assessment on one crop of the year only, the care which has been bestowed, makes it possible to review the incidence when the value of both crops is known.

Finally the results have been judiciously incorporated in a special experiment by Mr. Vaidya which is worked out with skill and carefulness. This experiment I have exhibited in a concise form in Appendix B. I look upon the results here secured as of the highest value. The following information regarding the agriculture of this locality is forthcoming from the experiments.

In *gorádu* (sandy loam), and *bhuri* (gray loam unmixed with sand), double crops are grown without the help of irrigation. In the latter, maize and rice are the chief early crops, but rice is apparently not grown in the former; on the other hand while gram or wheat are both suitable as late crops in *gorádu* land, gram appears the more successful in *bhuri* land. Minor crops as *udid*, *rámtal*

and *san* replace the rice or maize occasionally. I judge that these are used as restorative crops rather than regular ones. The late crop does not generally cover the whole area sown in the kharif season but is generally confined to the more water-retentive portions of fields.

The manure is put on at the rate of about 2 cart-loads per acre in May though a larger quantity is used when it is available. The manure is ploughed in with the first ploughing. The maize is sown by a single tube attached to the plough, at the rate of 12 lbs. per acre. The sowing plough crosses the furrows of the first ploughing. Later on when the crop is about 1 foot high, the plough is taken between the rows to earth up the growing plant and weaken weeds. The land is light and only 2 bullocks are yoked. Hand-weeding is necessary. This requires generally the employment of hired hands. Labour is cheap, for they are secured at $1\frac{1}{4}$ annas a day. Cattle are allowed a little grain while ploughing. The maize crop is reaped by home labour which shows that the cost is small. Maize is sown in the middle of June and is a 4-month crop. Wheat and gram are sown in the middle of November. The land is previously ploughed, four times for wheat and thrice for gram. Wheat always pays for extra cultivation. The maize stubble is removed with the second or cross-ploughing. With the last ploughing the seed is sown by the seed tube, *orni*, attached to the plough, which makes the drill. Neither of these crops are hoed or hand-weeded. Both ripen about the end of March, *i.e.*, in 4 months or a little more. The crops are pulled by home labour or hired hands. If the latter, 6 men pull an acre of wheat and 8 an acre of gram in a day and receive $1\frac{1}{4}$ annas cash or 2 sheaves of wheat or 2 bundles of gram, each equivalent to about 3 *sers* of grain or pulse. Labour again is thus shown to be cheap. Seed is sown at the following rates per acre: 50—60 lbs. of wheat and 40—60 lbs. of gram. In the Deccan wheat districts the reaping costs about 12 per cent. of the yield; in the Southern Marátha Country grain equivalent to the seed sown or less. This equivalent is about 12 per cent. of the crop, so that in the Panch Mahals reaping wheat costs about $\frac{1}{3}$ what it does elsewhere as shown. For threshing it appears that an interchange of cattle among small holders obviates cash or grain expenditure. The hire rates are indicated however, *viz.*, 3 men at $1\frac{1}{4}$ annas or 3 *sers* grain each and 8 bullocks at 1 anna each thresh the crop of an acre in a day. Cost per acre therefore about 12 annas or slightly more than 1 anna per Imperial maund (82 lbs.), taking the crop at 10 maunds (of 82 lbs.) *i.e.*, the average of the experiments of the district. Here again the cost is less than in the Deccan or Southern Marátha Country. In the former I have carefully calculated the cost to be 2 annas per Imperial maund. In the latter I have recently computed the cost to be about 2 annas per Imperial maund. That enquiry showed that 8 bullocks with 4 men can thresh 4 local maunds (= 10 Imperial maunds) in a day. The cost is with the higher wages just 2 annas per Imperial maund. To these must be added the cost of winnowing, which adds 1 anna per maund, though it will be less with the low hire wages of the Panch Mahál's; perhaps here $1\frac{1}{2}$ annas would cover both threshing and winnowing. The experiments do not clearly bring out the cost of threshing gram.

Incidence of Assessment.

In the tabular statement the incidence on gross produce calculated on one only of the chief crops of the year is shown as follows:—

	Average.
Maize—11·69 to 13·81 per cent	13 per cent.
Wheat—6·72 to 18·86 „ „	10·9 „
Gram—13·39 to 16·55 „ „	14·5 „

Now taking the average outturn of all the experiments for both kharíf and rabi and the average rate of assessment, the incidence of assessment on both crops (early and late) together will be seen to be as follows:—

Maize followed by wheat	6 per cent.
„ „ gram	7 „

The incidence of assessment on net produce can be also obtained from the special experiment. The net produce on this field assessed at Rs. 9 is Rs. 30, therefore the incidence of assessment on net produce is 30 per cent.

I will not attempt to calculate the cost of cultivation of each of the crops because several minor details are uncertain. But the following consideration will show a very close approximation, supposing the cost of cultivation of each of the chief crops is the same and there is no great difference. Unfortunately the cost of the by-products is not given. It is very small. The wheat straw is almost valueless. The cost was grain wages worth Rs. 59 and cash wages 13 = Rs. 72 or Rs. 23 per acre, or Rs. 11-8-0 for each crop.

Broach.

The experiments from this district are few and of little value. The Collector explains that special municipal duties prevented his District Deputy from making any experiments and heavy magisterial duties left Mr. Gibb (who contributes the two experiments of this district) very little leisure.

Surat.

Mr. K. R. Bamanji, Assistant Collector.

Mr. Bamanji sends in 6 ordinary experiments. The work done does not show evidence of adequate care or consideration. Two tests on cotton are omitted from the tabular statement. In one of these the incidence (column 10) is shown at 21 per cent. and in the other at 42 per cent.,—a difference, which though remarked, is not in any way explained. Moreover the outurn of the cotton is estimated from the result of the first picking, on the gratuitous assumption that the proportions of the three pickings are as 4 : 8 : 4. I say gratuitous, for no authority is quoted and no argument or reason vouchsafed. A little experience will, I think, prove to Mr. Bamanji that his statements—

"One man with 1 pair of bullocks can plough 3½ acres a day.
" " " " harrow 4½ " "
" " " " level 14½ " "

and the like are exaggerated.

Mr. Umedrám Ranchhoddás' experiments call for no comment.

Tha'na.

No experiments have been received from this district. In the 1st Assistant's charge the frequent change of officers gave no opportunity. In the 2nd Assistant's charge Mr. Morrieson left notes which his successor was unable to work up. Mr. Thatte, District Deputy Collector, was relieved of the duty at my suggestion (*see* last year's report, p. 11). Mr. Atkins was on forest settlement duty.

ANALYSIS OF CROP EXPERIMENTS.—CENTRAL DIVISION, 1884-85.

Sa'tá'ra.

Mr. H. R. Cooke, Assistant Collector.

Mr. Cooke has submitted one experiment. The area cut (10·3 gunthás) was ample. The weight of straw is not given, and the quantity of manure is vaguely stated. Experimenters should invariably indicate whether the amount of manure entered in column 15 is (1) per acre, or (2) for the whole field, or (3) for the area selected for experiment only, or (4) for the whole area covered by the crop selected for experiment. Manifestly when this explanation is absent, I am left to guess which of the four possible interpretations is intended. Generally it is possible to make a fair guess, but I may be misled. As this remark applies more or less to all the experiments received, it suffices to notice the omission once, with the request that experimenters should pay attention to the point. Similarly I must notice the necessity of giving the weight of the straw. The bundles vary much with the locality and season, and it surely cannot be difficult to comply with the requirements of column 20, which demands the weight in lbs., but which may also give the number of bundles. This column should always indicate whether the straw or other by-product was weighed fresh or dried.

Mr. Cooke gives an interesting note. Two fields ($5\frac{29}{40}$ acres) assessed at Rs. 9-8-0, are given for cultivation by the occupant—a missionary—to a servant in lieu of Rs. 3 per mensem of the servant's pay. The occupant thus receives practically Rs. 36 per annum for land on which he pays Rs. 9-8-0 plus local funds. The servant—a Mhár—instead of cultivating the land himself sublet it to a rayat agreeing to give seed and manure, receiving $\frac{2}{3}$rds of the gross produce. (Mr. Cooke says "net produce" but the context shows that the "gross produce" is meant). The manure cost about Rs. 3 per acre, and seed 8 *as.* About 5 acres only were actually cultivated. The Mhár received according to the results of the experiment, clear of deductions on account of seed and manure, Rs. $62\frac{1}{2}$ in lieu of Rs. 36 as pay from his master. The sub-tenant received Rs. 40 in return for his labour and risk or Rs. 8 per acre. This may be taken as the cost of cultivation if the value of the manure, Rs. 3 per acre, is added. It must be remembered that the year was favourable. If Mr. Cooke had worked out these results it would have been more satisfactory, for such deductions as I have drawn would have been made by him with local knowledge and more safeguards against the liability of misjudging the risks incurred by each party.

Mr. B. G. Sáthe, District Deputy Collector.

Mr. Sáthe has given much time to crop experiments and exhibits considerable interest. He has selected large areas for experiment—in one case $5\frac{1}{2}$ acres, in another $6\frac{15}{40}$ acres. If every operation was minutely supervised as is above all things essential, much patience must have been brought to bear. Careful examination of the recorded results aided by after-correspondence has however shown that Mr. Sáthe fell into grave errors which so greatly detract from the value of his work that his experiments cannot appear on the record. I point out the faults not to discourage Mr. Sáthe or to hold him up to censure but because it is absolutely necessary to put him and other officers on their guard.

For one experiment (a special experiment), a large field was chosen. The cropping was given as follows :—

	A.	g.
Jowári	6	0
Gram	4	0
Sugarcane	1	26
	11	26

No intimation was afforded as to how the areas were ascertained. I asked for information and Mr. Sáthe replied that as he had no way of measuring the areas, he took the village record in Form III as correct, or "for granted" as he says. Nothing could have been more unsafe than this. The village record may be fairly accurate for statistical purposes, but to accept it as correct for such deductions as these experiments require, is a grave error. This error vitiates the ordinary experiment also, because Mr. Sáthe must have taken the area reaped, 5½ acres, from the village record. He could not have measured it.

In Ahmednagar Mr. Winchester found that in one field wheat and gram measured 2 acres 23 gunthás and 2 acres 39 gunthás respectively, but were entered in Form III. at 4 acres each.

The heading of column 19 demands that the equivalent in lbs. should be ascertained by "*actual test.*" Noticing that the *ser* had been taken at 110 tolás for both gram and jowári which I know cannot be, the question was asked—"Did you actually weigh the contents of the local *ser* for gram and for jowári separately in order to fill in column 19."? The reply received was—"No. The measures in use in this district are of an uniform weight and stamped with an official seal. The contents of a local *ser* are Rs. 110 in weight." A confusion between the *ser* measure of capacity and the weight *ser* is very common. To avoid such confusion, the heading of column 18 clearly indicates that the *measure ser* is to be used for the figure for that column. There does not appear to have been this confusion in Mr. Sáthe's mind, but a confusion which it is hardly conceiveable that an experimenter could have experienced. How far undiscovered instances of such confusion have vitiated crop experiment reports and led to wrong deductions it is impossible to say.

It seems advisable here to notice another instance of confusion which occurred in another district. The return showed that the contents of the *ser* had been estimated for column 19 as equivalent to 80 tolás exactly for jowári. Thinking that perhaps the weight *ser* had been confounded with the capacity *ser*, enquiry was made. The report received showed that the test had been made as follows :—A common balance was taken and a weight of 20 tolás put into one scale-pan. The other pan was filled with jowári till the balance was secured. The contents of the pan were then poured into a *ser* measure. More jowári was weighed till the measure was full. It was found that 80 tolás of grain filled the measure "to the brim." I naturally concluded that the expression "to the brim" showed that a *struck* measure had been recorded. I know of no place in the Presidency where a struck measure is used. Heaped measure is the universal practice. It appears however that this was meant by a measure filled "to the brim"—an expression quite inappropriate and incorrect with respect to a heaped measure. So far the confusion arose from the mis-use of an English expression. But the manner in which the test was made was in itself faulty. The test should have been made by carefully filling the measure and then by weighing the contents. In the instance I am referring to, the test was made over again at my request. The result was that whereas the *ser* of jowári weighed exactly 80 tolás at the time of the experiment, the same jowári measured in the same *ser* measure weighed 83 tolás on one day and 81⅝ the next. The difference no doubt was due to the manner in which the *ser* was filled. The experimenter however attributed it to the weather.

Another error is almost universal. The pound is taken as 40 tolás. For practical purposes the round number may be sufficiently accurate, but it will be more correct to take the pound as equivalent to 39 tolás for such delicate work as that of the test required by colum 19.

Seeing how grave are the results in crop experiments due to ignorance and misconception on these points, I would ask that the following rule be added to the standing orders on crop experiments :—

> "In ascertaining the equivalent in weight (column 19), of the measure recorded in column 18, it is directed that in every case the experimenter shall cause a grain-dealer in his presence to fill the local *ser* measure fairly and then to weigh the contents in a carefully tested balance. The counterpoise shall be Government rupees. Thirty-nine rupees shall be taken as the

equivalent of the English pound. One test is not sufficient, but with each kind of grain the average of 4 tests at least shall be taken. The grain must be well dried. Some grains dry more quickly than others. But it may be laid down that the test shall not be made till at least 7 days after the crop is reaped. The experimenter shall further in column 19 add the result of his test thus :—1 *ser*= tolás and shall enter in column 18 the number of *sers* not *khandis, pharás, máps, mans, páilis, adholis*, and the like, which are varying and uncertain measures."

Mr. L. G. Deshmukh, Assistant Collector.

Mr. L. G. Deshmukh has submitted a careful experiment on sugarcane. It is his first attempt and is very creditable. The cost of cultivation is, however, over-estimated. The following is an abstract :—

		Rs.	a.	p.
(1.)	*Seed*—640 canes purchased at the rate of 32 canes per rupee	20	0	0
(2.)	*Manure*—1,200 sheep folded for 10 days at rate of 2*as.* 8*ps.* per 100 per diem (Rs. 20), and 45 cart-loads of cow-dung, ashes and sweepings at 3 loads per rupee (Rs. 15).	35	0	0
(3.)	*Preparation of land and planting*—2 men with a plough drawn by 10 bullocks took one month to plough and plant	46	8	0
(4.)	*Watering charges*—2 men and 1 pair of bullocks daily for 5 months and two days out of three for 7 months (Rs 154). Add cost of *mot* (Rs. 13)—Total ...	167	0	0
(5.)	*Fencing*	5	0	0
(6.)	*Watching*	54	8	0
(7.)	*Weeding*...	15	8	0
(8.)	*Earthing up*	4	12	0
(9.)	*Preparing jágri or gul* (including cutting)	35	0	0
(10.)	*Payments to balutedárs*	12	12	0
		396	0	0

It is clear that the charges under heads (4) and (6) are excessive. If watering went on the whole year with one man at the well and another in the field, surely a watchman was not required at all. Again it is impossible that the crop could have required so much water, even supposing the rainfall to have been of no use at all.

Na'sik.

The expriments received from the Násik District are of very little value. I pointed out last year the extraordinarily low yields reported (Crop Experiment Report, p. 17), and showed the necessity of testing the formulæ. The Commissioner concurred (Report, p. 108) with me in my opinion that the work done was inadequate. I regret that there is no improvement either in quantity or quality.

Mr. Náráyan Bhikáji, District Deputy Collector.

Mr. Náráyan Bhikáji does not understand the distinction between a special and an ordinary experiment. He has taken small tests in 4 different occupancies some of them of considerable area, and deduces from this very insufficient datum that the net profit on the holdings varies from 15 annas to Rs. 1-12-0 per acre. He assumes that he is able to calculate the yield of all the fields of each holding by the results of an ordinary experiment in a wheat field of each.

Mr. G. Scott, District Deputy Collector.

I have omitted from the record an experiment submitted by Mr. Scott, Acting District Deputy Collector. The crop was a variety of wheat called *khapla*, Triticum speltum, which Mr. Scott thought a strange one—whereas it is the commonest irrigated variety of the Deccan. He finds the yield from 51 lbs. of seed to be 256 lbs. The crop clearly did not pay the speculator who leased 7 acres from various occupants at Rs. 100 per annum. But Mr. Scott concludes that "one thing is quite clear, that the charge of over-assessment on the land cannot be maintained, as we find the people (as in this case) ready enough to pay enormous sums for the use of lands for which they pay Government the most trifling assessment." This may be true, but it is a wrong deduction from

this experiment where, including special water-rate, the incidence of assessment on gross produce is 97 per cent.! Mr. Scott however by miscalculation found the incidence only 1 per cent.

I would reiterate the request made in my remarks last year. A case for special enquiry is made out. If the results reported are trustworthy the formulæ are egregiously incorrect. My own opinion is that the reported results are at fault.

Kha'ndesh.

The officers of this district have fully made up for short work noticed last year and have contributed a large number of careful experiments.

Mr. J. Davidson, Assistant Collector.

Mr. Davidson's two tests show a very high incidence of assessment, but the figures are no doubt correct. The explanation is simply that in Sháháda the *kharif* season was most unfavourable, and the only crop which was available for experiment in the *rabi* season was linseed, to which the untimely late rain and excessive cold had been disastrous. In writing to the Collector Mr. Davidson remarks: "you are aware that the assessment in Sháháda is a heavy one." Whether it is or not the experiments reported cannot be put in evidence to support the charge.

Mr. G. D. Pánse, Assistant Collector.

Mr. G. D. Pánse made 6 ordinary experiments in the Virdel, Chopda and Shirpur Tálukás. Of these one on cotton has been rejected, because the area selected for experiment was below the prescribed minimum. Mr. Pánse deserves credit for the attention paid and the care with which he selected his crops. He is of opinion that the Khándesh rayat is slothful and unenterprizing, and that he might get much more than he does out of the fine land which he cultivates. One special fault is that most own more land than they can till carefully and so suffer greatly in bad seasons. Some doubt is thrown on apparently correct figures in these reports by the frequent occurrence of palpable inaccuracy and carelessness in others. His attention to the remarks regarding the proper method of recording the quantity of manure and the weight of straw made above under Sátára, is requested.

Mr. Shridhar Gundo, District Deputy Collector.

Mr. Shridhar Gundo comes next with 5 experiments in Chálisgaon and Amalner on different crops. There were *dusota* or late crops following early crops of the same season. Of these *dusota* crops one only was irrigated. The cultivators of this part of Khándesh evidently do try to get as much out of their land as possible and the suspicion at once arises that Mr. Pánse may have been dealing with *dusota* crops (*see* experiments Nos. 13, 14), unwittingly, when he charged the cultivators with want of enterprize. I think that Mr. Shridhar Gundo takes 16 annas to represent an average crop. The usual idea is that 12 annas represent an average, but 16 annas an unusually fine crop, such as can only be secured when the many circumstances affecting the outturn are each and all fully favourable.

Mr. R. A. Lamb, Assistant Collector.

Mr. Lamb submits two experiments. One an ordinary one, which is very interesting as showing how the Khándesh cultivator deals with the risk attendant on the cotton crop. I believe I am right in saying that he sows cotton in the fields prepared for that crop whether the season is promising or not. It appears in this case that he interspersed rows of *tur* with the cotton. The cotton was miserable, but the *tur* gave a fair return. Had the cotton turned out well probably the *tur* would have been very poor. The Khándesh Farm is endeavouring to test another device for making up in some degree for a poor cotton season. Mr. Stormont does not follow the practice of his neighbours of pulling up the cotton and sowing a late crop. But he leaves the cotton and intercultivates it with gram or linseed. Something is thus got from the cotton while the later crop is not injured by the presence of the poor cotton. The practice of interspersing rows of *tur* among cotton does not, I believe, hold near the Farm, but it

is worthy of Mr. Stormont's notice.

As regards the special experiment it must be noticed that experiment No. 21 of the list shows the detailed results of a special test taken in connection with the experiment.

The area of which the holding selected for the special experiment is a part, consists of various survey numbers separately allotted among the members of a large divided family, as well as of numbers cultivated in common by the sharers. It contains garden and dry-crop land and even land assessed as garden but only sown with dry-crops and land classed as dry-crop which has by private improvement been transformed into garden. It is a special experiment which presents great complications and difficulties but has been masterfully manipulated by Mr. Lamb, an experimenter of considerable experience with a decided liking for this interesting subject. I propose to summarize the report save and except that difficult portion in which the experimenter deals with crops which he did not specially test for the purposes of the experiment (*vide* Appendix C.) This portion of the report is most valuable and will be an excellent guide to less experienced officers. The only feature of the experiment which should not be copied, is the attempt to deduce the outturn of a holding consisting of no less than 7 crops by the single test of one. As a fact Mr. Lamb only estimated by actual test the *bájri* crop, which covered only 35 gunthás out of the holding of over 12 acres. This feature I say, is not to be imitated. Still the fact that Mr. Lamb was left to other methods than actual test in the holding to estimate the yield of the other 6 crops, has led to the exhibition of much ingenuity. The manner in which this officer has made his own old coats and even the coats of others (to borrow his illustration) fit his present conditions, is worthy of careful study. The calculations are marked throughout by the strictest accuracy, and the carefulness of the application of the results of other experiments to this particular one leaves nothing to be desired.

Ahmednagar.

Mr. C. H. Jopp, Assistant Collector.

Mr. Jopp sends in two experiments on wheat attacked with rust. His main object was to gain some knowledge as to the extent of the damage done by this disease. Mr. Jopp concludes that the effect was discolouration rather than destruction of the grain. If Mr. Jopp had succeeded in finding similarly conditioned wheat close by, unaffected with rust, I feel sure that he would have been satisfied that not only the quality of grain and straw was much diminished, but the quantity also. When rust is really bad the grain is shrivelled so that the colour and consistency of the variety are not distinguishable. As it was the sample commanded a low price. If even he had counted the number of grains in the ear and compared it with uninjured wheat, he would have secured similar evidence. I notice one important fact. The Nagar *ser* of good wheat is 115½ tolás (*vide* Crop Experiment Report, 1883-84, p. 60). Mr. Jopp's test showed it to be 108 tolás only. The difference is caused by rust and that not of a severe type.

The other experimenters in this district, Messrs. Winchester and Deshpánde, have submitted test experiments which tend to show that jowári was more affected by the absence of timely late rain than wheat or gram. The notes of the experiments are recorded.

Shola'pur.

Mr. E. L. Cappel, Assistant Collector.

No remarks are required by Mr. Cappel's experiment beyond those given in the statement.

Mr. Sorábji Padamji, Assistant Collector.

Mr. Sorábji Padamji sends in two special experiments. One is vitiated by the insufficient areas of plots experimented on. In one field where jowári, and linseed, wheat and gram, the last three interspersed with rows of kardai, were grown, the tests to estimate the crops (save and except jowári) were only 2 gunthás

in area. The rules prescribe a minimum of 6 gunthás. This rule is not to be neglected because the experiment is called a special one, for the standing orders lay down that a special experiment is to be made up of a series of ordinary experiments. I might have made an exception in this case but that the whole report is very off-hand. The areas under each kind of crop or crop mixture are not even stated. The other experiment is on a sufficient area and might perhaps be entered as an ordinary experiment, but the 8 gunthás are made up of plots of only 1 guntha each. In my remarks (Report, p. 18, of 1883-84) I noticed the danger of such small areas and this taken with the inaccuracy of Mr. Padamji's work (last year's Report, p. 19) makes it unsafe to place his results on record. I would recommend his study of Mr. Lamb's report given in Appendix C. before he undertakes a special experiment again.

Mr. V. B. Vádekar, District Deputy Collector.

Mr. V. B. Vádekar contributes 2 experiments, one of which he calls a special one, but it has no claim to the name. Last year this officer reported an outturn of 4,452 lbs. per acre of *khapla* wheat. This year he finds the yield only 1,312 lbs. for a 12-anna crop, which he gives as equivalent to 984 lbs. of wheat. I presume that he means that the produce was 1,312 lbs. in husk, equivalent to 984 lbs. clean grain.

The time taken up by careful study of these experiments is great. I do not grudge it. It is excessively interesting to me, but I trust that Government will not think me to blame for refusing to waste time on experiments which evince no care and no interest, and where the want of comment and explanation leaves me still with the feeling that deductions are not safe. I cannot put on record figures which are not capable of careful check. I would further here ask that Collectors will insist on the experiments being reported on printed forms. Mr. Vádekar's report is sent in on 32 pages of foolscap, while every word he has written might easily have been submitted on one of the printed forms.

Poona.

Mr. P. C. H. Snow, Assistant Collector.

Mr. Snow sends in 3 ordinary experiments taken in the village of Ghoda in Khed. They are especially interesting as being all on second crops in high farmed irrigated land. It is noticed that sugarcane is the chief crop on such lands, but in years when cane is not grown, bájri is usually sown in the *kharif* season, followed by wheat, gram, potatoes, or peas in the *rabi*.

Mr. R. A. L. Moore, Assistant Collector.

Mr. Leslie Moore made 2 ordinary experiments on irrigated land in the Indápur and Sirúr Tálukás. In both I think he has made errors which are not apparent, but which led him to greatly over-estimate the outturns. His attention is requested to the remarks on sugarcane experiments and the manner in which the results should be shown (*vide* page 26, Crop Experiment Report, 1883-84).

ANALYSIS OF CROP EXPERIMENTS.—SOUTHERN DIVISION, 1884-85.

Belgaum.

Mr. Gurshidápa Virbasápa, District Deputy Collector.

One experiment from Mr. Gurshidápa Virbasápa is entered in the list. The rich jowári of the Krishna valley was experimented on by this officer for 2 years, but he has now selected land dependent solely on the rainfall. The lowness of the assessment points to a low maximum, due to uncertainty of rainfall, for the soil is black. The attention of this officer is requested to the remarks under Sátára, regarding the importance of care in making the actual test (for column 19) of the weight of grain, contained in the customary heaped measure. It may also be indicated that grain, especially a soft variety like jowári, cannot be said to be well dried the day after threshing. The simplest plan is for experimenters to measure and weigh the grain fresh, and then to take off with them a small sample of 1 or 2 lbs. This should be weighed in 2 or 3 weeks according to the grain, and the entry for the proper column corrected accordingly.

Mr. J. J. Heaton, Assistant Collector.

Mr. Heaton has submitted experiments showing a grasp of the subject and an interest in it. I have printed his reports in full (Appendices, F. and G.) and propose to discuss them in considerable detail, because they bring up many important points.

Experiment No. 2.—The first point to notice is the deduction of the waste or unsown portions of land, excluding what is deducted as pot-kharáb or unarable by the Survey Department. In this case it was 1 acre in a field of 15 acres. This point is of especial importance in special experiments where the gross outturn of a whole holding is calculated. It is not always a necessary point in ordinary experiments because in them the outturn per acre is the object of estimation. But above all things it demands careful attention in crop inspection by village officers. The Circle Inspectors in Dhárwár and Bijápur have received careful instructions on the subject and it is emphasized in the revised Village Manual.

(2). Mr. Heaton asks for rules to distribute the area between the various ingredients of a crop mixture. These rules have been formulated for the Circle Inspectors and as close an adherence as is feasible will be gradually exacted from the village accountants. The case in point is very simple. The four-coulter drill sows 4 rows of jowári. On the last row, *tur* and *kulthi* are alternately deposited on the jowári by the seed-tube following the drill. The proportion is therefore Jowári : Tur : Kulthi : : 8 :1: 1. It may be argued that it should be 7 : $\frac{1}{2}$: $\frac{1}{2}$ and in some cases this would be the more correct proportion. But after careful consideration I have directed that the double rows should be twice counted. The reasons need not be here stated. This point is not important for crop experiments though it is all important in registering the area under each crop, as is required in the Village Form No. III. Here the entry for the field would be as follows :—

	A.	g.
Jowári	8	16
Tur	1	2
Kulthi	1	2
	10	20

Mr. Heaton is right however in estimating the yield of jowári and kulthi as he has done. His result is *not the yield per acre of either of these crops sown alone, but the yield in this particular mixture* where no one of the crops occupies the whole area. The Kulkarni made two errors. He omitted to deduct the unsown area, and he underestimated the area covered by the bájri and navani mixture. But his estimate otherwise was not far out.

(3). The reason assigned for the occasional though regular row of pulses with the cereals by Mr. Heaton, viz. that they should guide the bullock-hoe, is ingenious. It is rather a clever use of the regularity of the row than its reason. No doubt the underlying reasons are: first, that total loss may not follow the failure of the principal crop, and next, that such mixtures partake of the nature of a rotation. The pulse feeds on different ingredients from those which the cereal likes, and the rayat finds that he can by the judicious use of the mixture secure a greater return from his land.

(4). It is stated that *tur* is sometimes taken on every 5th row. I think Mr. Heaton is mistaken. The three-coulter drill shows a pulse row on every third or sixth row of the principal crop, for sometimes the pulse is sown only on the up and not on the down journey. But there is no 5-coulter drill and the tur must have a furrow to fall in.

(5). Mr. Heaton takes the pound as equal to 40 tolás; as stated above 39 tolás are more correct.

(6). I am not surprised to hear that the occupant of the holding experimented on by Mr. Horsely (Crop Experiment Report, pages 30—33, Southern Division, 1882-83), has lost his status.

(7). Considerable pains have been taken to show the cost of cultivation. The following abstract will show the work involved in carrying out the task which I undertook when I asked that experimenters should describe the various acts of husbandry and leave me to calculate the cost. I must abandon that task and leave it to the option of experimenters to deal with the whole calculation or leave it alone. The minuteness of the enquiry is evident from the necessary details included in Mr. Heaton's report. These details are nearly enough to enable me to calculate the cost, though he leaves me to estimate the figure to be put against the work of a man and of a pair of oxen per day. Few experimenters have gone so thoroughly and accurately into the details.

Cost of cultivation per Acre of good land in Chikodi.

	Men.	Oxen.	Days.	Cost. Rs.	a.	p.
1 Deep ploughing in December in alternate years	2	8	4	1	8	0
2 Heavy harrow used in the year in which the ploughing is not done	3	8	2	0	14	0
3 Harrowing after early showers with medium harrow	1	4	1	0	6	0
4 Cross harrowing	1	4	1	0	6	0
5 Levelling with the light harrow ...	1	2	1/3	0	1	4
6 Clearing and burning stubble	5	0	1/3	0	3	4
7 Carting manure and spreading	5	2	1/5	0	3	0
8 Cost of manure, 1 load per acre ...	0	0	0	0	8	0
9 Harrowing in the manure	1	2	1/3	0	1	4
10 Sowing 4-coulter drill followed by seed-tube	2	2	1/4	0	1	6
11 Covering in seed with light harrow ...	1	2	1/4	0	1	0
12 Smoothing seed-bed with brush harrow .	1	0	1/8	0	0	3
13 Bullock-hoeing 1 month after sowing ...	2	2	1/3	0	2	0
14 Second hoeing	2	2	1/3	0	2	0
15 Hand-weeding	4	0	1	0	8	0
Total ...				5	1	9

This gives the cost up to harvest, though the value of the seed will have to be added. I have taken the cost of a man at 2 annas a day, of a bullock at one anna, and of a cart at 3 annas a day (besides the bullocks). I believe these rates are fair, though they vary. In the cost of the deep ploughing and heavy harrowing, as the operations are done alternately, only half the charge has been made.

In light land the yearly ploughing costs Rs. 2-3-0, in lieu of the alternate ploughing and harrowing (Rs. 2-6-0) on heavy land.

I trust that this abstract may induce experimenters, when they have time, to describe generally the cultivation as Mr. Heaton has done and to attempt also to work out the cost. I think the time taken by the various operations has been fairly accurately estimated by Mr. Heaton. This difficult point is less difficult in the Kánarese districts, where there is a good guide in the fact that the area sown by the drill in one day is the usual land-measure. Where the four-coulter drill is used the *kurgi* of land is roughly four acres, but it is only about three acres where the three-coulter drill is used.

Experiment No. 3.—On rice in the fine rice land near Belgaum where a second crop is always taken. The cultivation is well described, and I subjoin an abstract to show the cost. The method adopted to calculate the incidence of assessment is excellent, but as noticed above is a method which is requisite for special experiments. It is also very valuable when an uneven crop, as that of the present one, is being dealt with in ordinary experiments.

In finding the value of the gross produce, Mr. Heaton rightly endeavours to ascertain the value of the 2nd crop. But as this in the present instance is difficult, I prefer to calculate the incidence on the rice crop alone and show the estimated incidence in the remarks column for the whole year's crop. To estimate the 2nd crop, Mr. Heaton took into consideration the outturn of an excessively bad crop of peas in his other experiment.

Cost of cultivation per Acre of Rice land near Belgaum.

(Cultivation for the rice crop following a late crop of gram, peas, or wheat of the previous year reaped in March).

	Men.	Bullocks.	Days.	Cost. Rs.	a.	p.
1 Two bullock harrow to loosen the upper soil	1	2	¼	0	1	3
2 Repairing embankments	4	0	1	0	12	0
3 Land thrice harrowed to break up soil and take out weeds	3	6	½	0	7	6
4 Thrice hoed with bullock-hoe	6	12	1	1	14	0
Clod-crushing	1	2	¼	0	1	3
5 Repairing embankments	4	0	1	0	12	0
6 Manure, 6 large loads per acre at 8 annas per load	0	0	0	3	0	0
7 Carrying manure	6	4	1	1	6	0
8 Spreading manure	1	2	½	0	2	6
9 Levelling before sowing and mixing manure	1	2	½	0	2	6
10 Picking off grass and weeds, man at 2 annas	1	0	1	0	2	0
11 Sowing, 6-coulter drill	2	2	½	0	4	0
12 Covering seed sown with seed and brush harrows	2	4	½	0	5	0
13 Cost of rice seed, 80 lbs. per acre ...	0	0	0	2	0	0
14 Weeding growing crop with bullock-hoe.	1	2	3	0	15	0
15 Hand-weeding at end of July and in middle of August, men at 2 annas ...	8	0	2	2	0	0
16 Thinning plants by hand, men at 2 annas	4	0	1	0	8	0
17 Cutting and stacking crop, men at 5 annas a day	11	0	1	3	7	0
18 Making threshing floor	4	0	1	0	12	0
19 Threshing and winnowing crop of ½ khandi paddy = about value of crop experimented on, at Rs. 2-8-0 per khandi of 2,400 sers = 3,600 lbs....	0	0	0	1	4	0
20 Carrying crop: 1 harvest cart with 3 pairs of cattle carries 1 khandi of crop and can make at least 2 trips a day; 1 khandi of crop = ½ khandi paddy roughly ...	2	6	½	0	6	0
21 Watching crop and regulating water-supply for 3 months, say 1 man to 4 acres at Rs. 4 a month	0	0	0	3	0	0
22 Customary dues, about 4 per cent. of the paddy=64 lbs. of paddy	0	0	0	1	8	0
Total (say) ...				25	0	0

Here the wage of a man is taken at 3 annas a day—the usual rate of the place except for certain operations where a lower wage is customary; cattle at 1 anna a day. The charges will cover the cost at hire-rates, and the cultivation and manuring suffice with small expenditure on harrowing to prepare the land for the 2nd crop. The pea crop is sown by hand after one light ploughing of the land with the 2-bullock plough. This calculation, if carefully studied, and properly applied, will be of great value to an experimenter on similar land for the purpose of ascertaining the value of the 2nd crop. I trust that this experiment will be made. It will give the material for calculating the incidence of very highly assessed land. It will be better if both early and late crops are carefully tested. It is to be noticed that rice is here grown without *ráb*. The seed is sown direct into the whole area and the seedlings are not transplanted. It is of high importance to ascertain why *ráb* is not used and why the transplantation of seedlings is considered unnecessary.

Experiment No. 4.—Peas after rice. The remarks in the tabular statement should be read. The experiment is reported because it gives the conditions of the crop. I may add that such a crop will probably pay the cultivator as it interposes a pulse crop between the two rice crops, even though its return is absolutely no more than the cost of cultivation.

Experiment No. 5.—Sweet potatoes. Instead of taking a measured area for experiment, Mr. Heaton has pulled three long rows out of 30 which cover in all 33¼ gunthás. I have no fault to find in this arrangement. I noticed this dentate variety of sweet potatoes, called the Viláyati variety, in Mangoli near Bijápur, where it was grown mixed up with the common variety. The crop is called the 2nd crop of the year. The first was tág or Bombay hemp. It is a question whether this crop was not grown as a green manure, though Mr. Heaton says it was ploughed in because it failed. In connection with this crop I would call attention to the proverb given in Appendix D of my Annual Report for 1884-85. Sweet potatoes do cost a good deal to dig out, but the benefit to the land is great. The details given are interesting. It is a pity that the tops were not weighed. The roots apparently were weighed fresh.

Experiment No. 6.—Betel-leaves. This interesting cultivation has been enquired into very carefully by Mr. Heaton whose report is given in full. Mr. W. S. Price made an experiment in the same táluka, and I studied the subject in the Dhárwár District. I print these reports with the notes taken by me together (Appendix G), and propose to add a few remarks comparing the results of these three independent enquiries.

As stated above Mr. Heaton's experiments are very valuable. He has given great attention to the subject and has placed on record information which is of the highest value, especially when it is remembered that great efforts are now being made to improve crop registration in the villages, and to ascertain facts bearing on the yield of crops. With the formulæ prepared under the orders of Government to estimate produce, enquiry such as that made by Mr. Heaton is extremely valuable. Assistant Collectors will have to supervise the registration of crops, and knowledge to enable them to guide Circle Inspectors and village accountants cannot be gained better than by utilizing spare time to study crop mixtures and the cultivation of such important products as betel-leaves, sweet potatoes, plantains, and the like.

Dha'rwa'r.

Mr. J. C. Anding, District Deputy Collector.

Mr. Anding's experiments are reported but they do not appear very trustworthy.

Mr. F. L. Charles, Assistant Collector.

Mr. Charles submits a special experiment taken on a holding of $10\frac{7}{16}$ acres cropped with a mixture of jowári, navani (Panicum italicum) and kulthi. It is owned by a child who lives with his widowed mother, but is sublet to a substantial rayat on a yearly lease locally called "Kor." The occupant receives half the gross produce, paying half the assessment and half the value of manure. The

land is dry-crop black soil assessed at Rs. 1-13-10 per acre. The most important fact elicited is that it pays the cultivator to pay half the assessment and half the gross produce (whether with or without deductions on account of grain wages to reapers and the like is not stated) for the right of cultivation. I cannot record the details of the experiment, for no intimation is given as to the proportions in which the three crops were sown. Only the jowári was tested. I know that in Dhárwár the early jowári is sown in very varying proportions with kulthi, tur, navani, mug and ambádi and that even the mixture with kulthi and navani is not constant, for I have seen navani as the principal crop with jowári as a subordinate one. This may be the case in the present instance. No attempt is made to estimate the outturn of the navani and kulthi, nor is any remark as to their quality given. These are essential conditions of a special experiment.

Mr. J. Fairlie Muir, Assistant Collector.

Mr. Fairlie Muir contributes, what the Collector justly styles, a most carefully made and consequently very valuable experiment. It is reported in full (Appendix D.). The important remarks regarding the serious omission from the crop registers of second crops in rice land have already been reported (Para. 15 of my Annual Report for 1884-85). I need scarcely say that the subject has received full attention in the orders under which the Circle Inspectors, the new supervising staff, are working.

The assessment levied on the embankments of rice fields appears to Mr. Muir to be unreasonable. It is clear from his own narration that all the embankments of the rice land are covered with a promising crop of beans. This is included in the dry-crop assessed area. He also admits that the cattle graze on the other portion of dry-crop land which he considers unarable. Without a full knowledge of the conditions of this land I am unable to state whether it is correct to say that cultivation of the dry-crop land is prohibited (*vide* note, page 70).

The tests taken by the experimenter to ascertain the proportion of the various products of unhusked rice are valuable. The proportion found was 79·43 per cent. of clean rice (including the broken rice and bran). I found the proportion of clean rice to be 70½, 75, and 74½ per cent. in the *Sakhvár*, *Kolamba* and *Sál* varieties (*see* Ráb Experiments Report, 1885, page 23). The proportion varies with the kind of rice and the proportion of broken rice and bran also varies with the skill of the grinders and pounders.

The fact noted by Mr. Muir that the rayats dispose of their crop in the shape of clean rice, is worthy of notice. In the Konkan and Gujarát as far as I have yet ascertained all rayats sell the paddy.

Bija'pur.

There are no experiments from Bijápur. The season was so unfavourable that crop experiments would have been of little value.

Ka'nara.

An experiment is offered, made by the orders of the Municipality, on "the reclamation ground in Kárwár" on the cultivation of rice with poudrette manure. The crop was apparently very fine, yielding 4,050 lbs. of paddy per acre. The rice seedlings were reared in a nursery and transplanted. The object was to show the benefit of poudrette, but as there is no standard for comparison offered, I hesitate to place the experiment on the record.

Ratna'giri.

W. Doderet, Assistant Collector.

Mr. Doderet has sent in 6 experiments on rice, two on náchni and two on varai. The values are calculated on the entries in the Price Currents, published in the *Government Gazette*, and a doubt arises whether the figures are correct. Experimenters are not intended to use Price Currents for the purpose of crop experiments, and rice is an ambiguous term. In the Fortnightly Price Currents the prices are apparently for clean rice. While in the Monthly Price Currents the prices are for paddy or rice in husk. The latter

fact is clear, but the former can only be presumed from a comparison of the two figures. For example, I take the figures at random for Kalyán in the Thána District:—

Monthly Price Current.	20th February 1885.	Paddy or rice in husk, 2nd sort.	Per Maund. Rs. a. p. 1 12 4
Fortnightly Price Current.	15th February 1885.	Rice, 2nd sort ...	Per Rupee. *Sers.* *ch.* 9 14 (retail.)

The *maund or man* = 40 *sers* of 80 tolás. The figures give the following:—

Monthly Price Current, 80 lbs., for Rs. 1-12-4.

Fortnightly Price Current, 20 lbs., for Re. 1-0-0.

It is clear that in the second case by rice is meant clean rice or else the figures are absolutely incorrect. Mr. Doderet at first calculated the values of his rice yields according to the Fortnightly Price Current, supposing that the entries therein were for paddy. He says to the Collector: "I now discover that I have made a mistake in estimating the value of the grain according to the Fortnightly Price Current. The prices therein given are said by you to be for unhusked rice. The tables are silent on the point, but I have a further suspicion that as the *sers* in these tables are given for the whole Presidency, there may have occurred a further mistake in estimating the value according to them. I now find that in the Monthly Price Currents the prices are given for rice in husk per maund by weight." He accordingly uses the latter entries. But from his remark regarding the *ser* it appears that he used the local *ser* which by the figures of his experiments is shown to contain 42 to 65 tolás of paddy. Again the word maund is vague. For it is not clear that Mr. Doderet noticed that the maund in the Monthly Price Current is the Indian maund of 40 *sers* of 80 tolás each. Again it would seem from the quoted remarks that the Collector considered that the entries in the Fortnightly Price Current were for unhusked rice, *i. e.* rice in husk, unless Mr. Doderet by a slip takes by unhusked rice to mean clean rice. With these elements of doubt I enter only the yield details in the statement. One other point must be noticed. Though the kinds of rice experimented on were partly early and partly late, Mr. Doderet selects the entries in the Price Currents for the "First sort of rice." The early rices are all, I believe, coarse rices. Besides the rice experiments, are tests of the yield of náchni and varai. The use of Price Currents in cases of these grains is not so risky as in that of rice. All the experiments are entered in the statement, but they are not sufficiently accurate to be used for any deduction.

Mr. C. P. B. Wiltshire, Assistant Collector.

Mr. Wiltshire made 10 experiments on rice in the Chiplún Táluka in 8 days—4 on early and 6 on late rice. He opens his remarks by stating that where the incidence of column 9 exceeds 10·3 per cent., he considers that it is higher than it should be. Though this incidence is exceeded in 2 of the early rice experiments, he considers that the flooding of the creek (Experiment No. 19) and the cultivation of rice in what is really varkas land (Experiment No. 22) explain the high incidence. He judges therefore that in early rice land the assessment is not proved to be too high. In five of the remaining six tests the incidence is higher than the standard which he prescribes, and he concludes that the low-lying lands *are* over-assessed, while the reddish lands *may* be. He shows that in some cases the amount of *ráb* was inadequate, while in others the cultivation was bad and the fields very weedy.

The report which contains these statements, does not go sufficiently thoroughly into the conditions of the cultivation of the tract to entitle me to offer any opinion. Ráb materials are obtained free of charge and the facts noted show that the standard of farming is not high. I presume that the experiments were made in land held under the khoti tenure and would refer to the general

remarks culled from Mr. Kázi Kamrudin's experiments last year (Crop Experiment Report for 1883-84, page 32). I have never visited this district and feel at a disadvantage in reviewing these experiments.

Kolaba.

Two experiments have been received from this district, but they were conducted by an officer below the rank of Deputy Collector. The experiments cannot appear on the record, for I do not see sufficient reason to permit an exception to the rule prescribed with the sanction of Government. The experiments were on rice. In one the incidence of assessment was shown to be only 4·7 per cent. In the other it was high (18·81 per cent.), though the yield, 2,051 lbs. of rice, was good. It is not stated in the latter case whether or not a second crop is taken on the land which, judging from the assessment, Rs. 9-6-6 I think almost certainly is the case.

I append some rough notes of experiments made by Mr. W. S. Price Assistant Settlement Officer, Southern Marátha Country Survey (*Vide* Appendix E.). Mr. Price's notes are very valuable and they are printed in this compilation for the sake of permanent record. The notes include tests made—

1. On Tobacco in the Chikodi Táluka of Belgaum where the crop is of a superior quality.
2. On Turmeric.
3. On Sugarcane juice for sugar-making.
4. On Betel Vine cultivation (*See* Appendix G.).

TABULAR SUMMARIES.

NORTHERN DIVISION.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
					Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	AHMEDABAD. *Mr. W. Allen, 1st Assistant Collector.*								
1	Paráńtij (Paráńtij) ...	Math ...	Crop poor	15½	84 pulse.	Not weighed but value estimated	3 12 0	1 2 6	30·77
2	Do. (Hájipur)	Do. ...	Do.	23	140 pulse.	Do. ...	3 7 6	1 0 11	30·50
3	Paráńtij (Ambaváda) ...	Jowári ...	8	16	620 grain.	450 bundles of Kadbi and 20 lbs. refuse grain.	14 12 2	1 14 6	12·91
4	Daskroi (Kamod)	Wheat (irrigated.)	Crop fair.	175	1,202 grain.	1,430 straw.	40 11 4	3 3 4	7·88
5	Do. do.	Barley (irrigated.)	Do.	140	1,881 grain.	30 lbs. refuse grain and 1,325 lbs. straw.	30 3 3	3 3 4	10·62
	Mr. A. F. Maconachie, Assistant Collector.								
6	Viramgám (Soklai) ...	Bájri ...	6	10	180 grain.	1,273 stalks.	9 1 0	1 2 3	12·02
7	Sánand (Sánand)	Early jowári.	4	12	260 grain.	4,426 stalks.	27 3 6	1 8 4	5·5
8	Do. do.	Rice ...	5	35	326 paddy.	133 straw.	8 13 1	1 5 10	15·5

REMARKS.

11

1-2. Experiments Nos. 1 and 2 were made in sandy (retál) soil on the kidney bean (Phaseolus aconitifolius). The rotation is bájri and math, the latter being the "manure" crop or the change-crop between the corn or principal crops. It corresponds with clover as a preparatory crop for wheat in England. The incidence of assessment appears very high, but to gauge it rightly both crops of the rotation should be considered. The experimenter states that the 1st experiment gives the result of very bad cultivation on poor land in a somewhat unfavourable year. The math followed a bare fallow in the 2nd experiment. In both cases the land is held on privileged tenure. In the former case 6 *as.* and in the latter 4 *as.* per acre represent the quit-rent. In the former the cultivator leased the land agreeing to cultivate and pay half the quit-rent and to give the occupant or inámdár half the crop. The lease was for two years and so apparently the cultivator looks for his chief crop (bájri) during the 2nd year. In the latter the land was leased for one year, the cultivator paying the full survey assessment and this on the subordinate crop of the rotation. In both cases Mr. Allen thinks that there is reason to believe that the experimenter reaped a crop which had been thinned by previous partial reaping. It is a pity that the by-product was not weighed.

3. Soil gorádu, light sandy loam. Rotation 1 jowári, 2 bájri, but I think there certainly must either be an intervening "manure" crop or else a mixture of pulses with the jowári or bájri. Manured at rate of 16 cart-loads per acre, valued at 8*as.* a load. The poor result is due to excessive rain.

4. The estimate of yield in annas is required by the standing orders and should have been made. Crop said to have been unmanured which I think doubtful, for it was irrigated from a well. Soil, as in experiment No. 3, gorádu, but apparently classed as bágáyat.

5. Barley following barley of previous year which appears strange. The test was made in the same field as the last one on wheat. Mr. Allen was first informed that no manure had been used but the cultivator afterwards admitted that he had used 5 loads of dung per acre, valued at Re. 1 a load. Why the value was so high is not stated.

6. Rotation 1 cotton, 2 bájri or jowári. Soil gorádu, but rather sandy. Unmanured; season of excessive rain but the land being high escaped excessive damage from flooding. Proportion of grain to straw very low; probably due to heavy rain.

7. Rotation alleged—1 bájri, 2 jowári,—*see* remarks under experiment No. 3. Soil gorádu. Unmanured; crop much damaged by excessive rain. Proportion of grain to straw very low. It looks as if the kadbi was weighed green or moist, but see remarks under experiment No. 13. Jowári may here as well as in Dholka be chiefly grown for fodder.

8. Rotation continuous rice. Soil very low-lying. Rain caused excessive water in such land. Manured but amount per acre cannot be deduced from the indefinite entry (*see* remarks on page 7, Analysis, Central Division). The seedlings were raised in a seed-bed and transplanted. No idea is given as to the extent of the seed-bed (*see* page 34 of my Annual Administration Report for 1883-84 under remarks on column 16 of the Crop Experiment Form.) How could the amount of seed per acre of rice be ascertained without first estimating the area of seed-bed and comparing it with the area planted out?

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
					Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. A. F. Maconachie, Assistant Collector—continued.								
9	Viramgám (Dumna) ...	Wheat (chásia).	...	70	650 grain.	880 straw.	23 10 4	1 9 3	6·6
10	Viramgám (Viramgám) .	Do.	...	70	646 grain.	753 straw.	23 2 0	1 1 4	4·7
11	Sánand (Thaltej)	Wheat and barley mixed (irrigated).	...	120	337 grain.	453 straw.	7 9 1	2 1 1	27·33
12	Viramgám (Mandal) ...	Wheat (chásia.)	...	70	475 grain.	520 straw.	14 13 6	1 3 7	8·24
	Mr. Edalji Dosábhái, District Deputy Collector.								
13	Dholka (Rajora)	Jowári ...	8	25	107 grain.	3,460 stalks.	27 2 2	1 8 3	5·58
14	Dholka (Sarora)	Rice (kamod.)	12	...	1,386 paddy.	3,380 straw.	40 0 0	1 9 7	3·99
15	Dhandhuka (Ránpur) ...	Wheat (irrigated.)	16	120	1,230 grain.	1,730 straw.	37 0 6	0 5 10	0·98
16	Do. do. ...	Do.	16	120	1,346 grain.	1,986 straw.	41 10 8	6 0 0 (Bágáyat rate.)	14·4
	KAIRA.								
	Mr. R. M. Kennedy, Assistant Collector.								
17	Nadiád (Dabhan)... ...	Tobacco ...	Average.	...	1,435 leaves.	...	143 6 5	5 6 9	3·77

	Remarks.
11	

9. Dry-crop wheat on black soil where cotton was first sown but was washed away. The land was then put under wheat. This was the case over a large area in Gujarát last year, and it is satisfactory to see how fully the cultivators in some cases at any rate were compensated for the loss of cotton by the success of wheat. The anna-valuation of the crop of wheat is omitted. The wheat was unmanured, but it should certainly have been indicated whether or not manure had been laid on for the cotton.

10. Dry-crop wheat sown on land where the cotton had been washed away. Black soil unmanured. This experiment corroborates the results of experiment No. 9. It is stated that the cotton was sown and washed away four times. Anna-valuation again omitted.

11. Wheat (vájia) was the crop intended but barley was mixed by error. No estimate as to the proportion is made. Land gorádu, of medium quality, irrigated from a well and classed as garden. Manure 4 cart-loads per acre of dung and sweepings; underestimated I think. Season too wet for irrigated crops, and crop poor. Mr. Maconachie gives the figures of columns 6 and 7 at 673 lbs. grain and 907 lbs. of straw, but his test-area was 6 gunthás, and the outturn 50½ lbs. grain and 68 lbs. straw. Either the test area should have been 3 gunthás instead of 6 or the calculations are erroneous. It certainly looks as if the test area was only 3 gunthás, but I have not even the anna-valuation to guide me.

12. Dry-crop wheat. Soil black. Season very favourable. No manure used. Rotation wheat and cotton, but cotton was not first sown as in experiments Nos. 9 and 10. This test was taken in connection with a special experiment, reviewed in the body of the report. The yield appears very low, especially when compared with the results of experiments Nos. 9 and 10. No comparison is drawn by the experimenter.

13. Rotation—1 cotton, 2 jowári. Soil gorádu, unmanured. High-lying land and so crop not injured as much y the heavy rain as that of low lands. Seeding very high. On enquiry I find that in this táluka jowári is chiefly grown for fodder. The season was also more favourable to straw than to grain. This enquiry also elicited the remark that in the formulæ the yields for *sundia* apply to such crops as these rather than for jowári as a grain-crop.

14. Rice grown on land lying in the old bed of a river after the floods receded in September. Unmanured. The assessment can show nothing as to the value of this land which has become available for cultivation since the survey. The rice was first sown broad-cast, but the seed was washed away. Seedlings were then purchased and planted out in September. The entry for seed 320 lbs. per acre is unexplained and has been omitted. *Vide* concluding remarks on experiment No. 8; column 6 apparently means paddy.

15. Wheat irrigated from a kachcha well. Till the passing of Government Resolution No. 5815, dated 18th July 1884, a charge of Rs. 5 per annum was levied on the well. Even if this charge is added to column 9, the incidence of column 10 would be only 10 per cent. for the well irrigated 1½ acres nearly, and this on one crop only; while with irrigation a double crop can be taken.

16. Irrigated wheat on land classed as garden. Manured at the rate of 12 cart-loads per acre. Soil good black.

17. Rotation—continuous tobacco grown from seedlings raised in a seed-bed. One acre of tobacco required a seed-bed of about 1⅓ gunthás. Land gorádu. Manured at rate of about 34 cart-loads per acre and thrice watered from a well outside the field. The land is classed as dry-crop. Season favourable, crop average. The leaves were weighed when cured and packed ready for sale. The curing consists in leaving them spread over the field for about 10 days. They are then sprinkled with water and packed. Mr. Kennedy did not permit the owners putting tobacco dust and inferior leaves in the centre of the packet, as is usual. The seedlings were transplanted in August and the crop was ripe in February. Cultivation good.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
					Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. R. M. Kennedy, Assistant Collector—continued.								
18	Thásra (Dákor)	Wheat (bálio).	...	40	940 grain.	1,513 straw.	41 12 4	4 14 3	11·7
	Mr. P. H. Dastur, District Deputy Collector.								
19	Mátar (Ralanpur)... ...	Wheat (kátha, a hard variety.)	8	37	872 grain.	904 straw.	24 10 6	5 11 5	23·17
20	Do. do.	Gram (a large variety.)	10	54	738 pulse.	...	14 15 6	4 11 2	31·38
21	Kapadvanj (Kapadvanj) ...	Wheat (bhallia, a soft white variety).	8	71	589 grain.	645 straw.	18 7 4	4 6 2	23·7
22	Do. (Rutalu) ...	Wheat (vájia, a hard red variety.)	12	62	450 grain.	520 straw.	11 15 8	1 8 9	12·91
	PANCH MAHALS.								
	Mr. R. K. Vaidya, District Deputy Collector.								
23	Dohad (Kathla)	Wheat (vájia.)	12	53	1,096 grain.	1,000 straw.	20 9 0	1 7 6	7·14
		Gram ...	10	64	643 pulse.	600 chaff.	9 8 9		13·39
24	Do. (Varbada) ...	Gram ...	12	40	750 pulse.	1,200 chaff.	11 1 3	1 8 4	13·73
25	Do. (do.)	Wheat (vájia.)	8	60	666 grain.	400 straw.	12 7 11	0 13 6	6·72
26	Do. (Delsar)	Gram ...	14	65	834 pulse.	763 chaff.	12 6 1	2 0 11	16·55
27	Do. (Ukardi)	Wheat (vájia.)	8	128	848 grain.	776 straw.	15 14 5	2 14 1	18·86

	REMARKS.
11	

18. Dry-crop blacksoil yielding generally an early rice crop follwed by wheat or gram. In 1883-84 the later crop was not taken. The experiment shows the return from the wheat following rice of the same season, and the incidence of column 10 is calculated on this crop alone. Soil unmanured and unirrigated, but the preceding rice crop was manured at the rate of 15 loads per acre. Cultivation good. The variety of wheat "balio" is a medium variety, not so good as the "málvi" wheat of the district. The anna-valuation is not given but the crop appears to have been excellent.

19. Wheat (dry-crop) following rice of the same season. Black soil. Crop damaged by excessive rain. Cultivation good. The preceding rice crop was manured at rate of 14 cart-loads per acre. Price Re. 1 per 40 lbs. grain.

20. Dry-crop gram following rice of same season. Cultivation poor. Unmanured. Black soil. Injured by excessive late rain. Price 60 lbs. per rupee.

21. Bhallia wheat (dry-crop) following kodra of same season. Gorádu soil. Unmanured. Cultivation bad. Field choked with weeds. The rate of sowing appears too highly estimated. Damage from excessive moisture. Price 34 lbs. per rupee.

22. Hard red (vájia) dry-crop wheat, following kodra of kharif season which was manured by sheep-folding. Soil gorádu. Cultivation careful. Price 40 lbs. per rupee.

23. Wheat and gram in different parts of a field on which an early manured crop of maize had been taken. The excessive rainfall of the season did not injuriously affect crops on high land as that experimented on locally called 'Bhuri' or light gray. The second crop was not secured over the whole area of the field. The incidence is calculated on the value of the second crop alone, and it may be noticed that the value of the straw is considered to be *nil*. This is no doubt the case of a maize district like the Panch Mahals. Wheat shows a lighter incidence than gram, but as is well known gram is a crop which enhances the yield of the succeeding crop.

24. Gram as a second crop following a manured maize crop as in the last experiment. The assessment shows the land to be a little superior. The conditions of this land and that of experiment No. 23 are nearly identical. Here however apparently the maize crop received a larger amount of manure.

25. The land of this experiment is similar, but inferior to that of experiments Nos. 23 and 24, which is evidenced by the fact that the second crop is usually gram. It is evidently too light for wheat. Wheat was, however, taken after the maize (manured) and not gram, probably owing to the seasonableness of the rain for wheat.

26. Better land. Gram again following maize. Manured. The cultivation was better than in Mr. Vaidya's other test-areas and the manure larger in quantity.

27. This experiment on wheat was taken in connection with the special experiment (reported in Appendix B.) The land was better, but the yield this season was not up to the mark, because excessive rain did more injury in heavy than lighter lands. Wheat followed maize of the kharif season manured at the rate of 10 loads per acre—a large dressing in comparison with that of the other experiments of this district. The incidence of assessment is comparatively very high owing to the excess of moisture noticed.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
					Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs	Rs. a. p.	Rs. a. p.	
	Mr. A'darji Jivanji, District Deputy Collector.								
28	Dohad (Dohad)	Maize ...	12	15	1,107 grain.	1,000 straw.	19 0 7	2 10 2	13·81
29	Do. (Rabdal)	Do. ...	8	12	650 grain.	525 straw.	11 2 9	1 4 10	11·69
30	Do. (Delsar)	Do. ...	12	32	981 grain.	1,050 straw.	16 13 9	2 4 7	13·52
	BROACH.								
	Mr. M. C. Gibb, Assistant Collector.								
31	Jambusar (Kavi) ...	Wheat ...	4	40	293 grain.	260 straw.	8 15 10	4 5 4	48·20
32	Do. (Dehegaum) ...	Do. ...	9	50	733 grain.	566 straw.	21 14 0	4 2 9	19·08
	SURAT.								
	Mr. K. R. Bamanji, Assistant Collector.								
33	Mándvi (Tadkeshvar) ...	Wheat (hánsia). ...	14	56	407 grain.	65 straw.	9 12 8	2 4 3	23·46
34	Do. do.	Do. ...	14	56	826 grain.	148 straw.	19 15 1	4 14 6	24·60
35	Mándvi (Tarsáda) ...	Wheat (kátha). ...	14	56	799 grain.	231 straw.	19 8 6	3 1 3	15·76
36	Do. do.	Do. ...	14	56	897 grain.	601 straw.	22 13 7	2 8 8	11·12
	Mr. Umedrám Ranchhoddás, District Deputy Collector.								
37	Chikhli (Phadvel) ...	Jowári ...	12	11	1,456 grain.	200 bundles kadbi.	35 6 8	1 1 8	3·11
38	Do. do.	Do. ...	12	11	1,285 grain.	210 bundles kadbi.	31 4 0	0 14 11	2·98

	REMARKS.
11	

28-30. In the experiments Nos. 23 to 27 tests were taken on late crops of wheat and gram following maize. Here, and in the two following experiments, the yield of the early maize crop was tested. About 2 cart-loads of manure per acre were used in each of the 3 experiments and spread in May. The quality of the land varied very considerably. In No. 28 it was gorádu (light sandy loam); in the next case it was bhuri or gray soil; in the third gorádu and black mixed. The incidence of column 10 follows the rate of the assessment very closely. The crop of experiment No. 29 was at the time of reaping noted to be very inferior. The crops were ripe early in October. There was heavy rain in September, which was unpropitious. The value of the maize stalks is not included in column 8. There can be no question that this omission is incorrect.

31. Dry-crop wheat in black soil, where cotton is grown. Mr. Gibb is very doubtful as to whether he was correctly informed by the rayat as regards manure. He enters the rate of manure at 10 loads per acre, but states that in a neighbouring village he was assured that wheat is not manured. In this heavy black soil the late excessive rain did much injury. It is possible that the wheat was a second crop. The experiment is not very thorough and therefore not worth reliance.

32. Conditions very similar to those of experiment No. 31 except that the more elevated position of the land prevented so great a damage from excess moisture from late unseasonable rain.

33. Dry-crop wheat on soil (kankaria or mixed with kankar), usually growing cotton, jowári and linseed in rotation. The wheat was sown therefore in unsuitable land. It was not manured. The late rains are stated to have favoured the crop. The experiment is not very valuable, because the experimenter came to the conclusion that the crop must have been tampered with.

34. Here wheat was a second crop after rice, which was manured at the rate of 6 loads per acre. Black soil, growing double crops of rice and wheat yearly. The incidence given is on the second crop only.

35. Apparently this land grows continuous wheat alone, without manure. The soil is styled morvania, an expression which is not explained.

36. Soil and rotation similar to experiment No. 35. Unmanured.

37-38. The land of experiments Nos. 37 and 38 had lain fallow for 30 years, till again brought under cultivation 4 years ago—a circumstance noticed by the experimenter as the chief reason of the "unusually good return of produce." If so, why are the crops estimated at only 12 annas? Soil black, mixed with kankar. It is stated that jowári stalks are not used as fodder, but are left in the ground till sowing time in the succeeding year when they are uprooted and burnt. This may be correct, but I much doubt it.

CENTRAL DIVISION.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principle Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
					Lbs.		Rs. a. p.	Rs. a. p.	
	SA'TA'RA.								
	Mr. H. R. Cooke, Assistant Collector.								
1	Wái (Bhuinj)	Kharíf, Jowári (Argad).	12 to 13	lbs. 15⅖	1,037 (grain)	516 bundles of straw.	24 10 2	1 13 5	7·46
	Mr. L. G. Deshmukh, Assistant Collector.								
2	Mán (Pingli Budrukh) ...	Sugarcane (Punda).	16	640 canes.	5,590 (gul).	lbs. 14,300 (tops and leaves).	305 10 0	2 8 0	0·81
	NA'SIK.								
	Mr. Náráyan Bhikáji, District Deputy Collector.								
3	Niphád (Karsul)... ...	Wheat Pivla, Hard white	12	lbs. 24	468 (grain)	lbs. 480 (fodder).	10 4 0	1 2 2	11·07
4	Do.	Do. ...	12	23	465	560	10 4 4	1 2 8	11·35
5	Dindori (Jánori)	Wheat Kátha; Hard red.	14	60½	579	560	14 2 8	1 0 0	7·05
6	Do.	Do. ...	8	48½	280	306	7 1 4	1 1 0	15·00
	Mr. E. C. Morrieson, Assistant Collector.								
7	Kalvan (Abhona)	Gram (C. arietinum).	12	58	139	249 (bhus.)	5 6 8 (grain only)	0 12 0	13·84
	KHA'NDESH.								
	Mr. J. Davidson, Assistant Collector.								
8	Sháháda (Mulloni) ...	Kharíf Jowári.	6 to 8	7	266	60 bundles.	6 1 1	2 5 4	38·45
9	Sháháda (Prakásha) ...	Linseed and Mustard.	9 to 10	4 ½	322 15	... ...	10 11 3	2 10 0	24·52

	REMARKS.
11	

1. Argad is an early variety of jowári grown principally for fodder, and generally on light lands. In the present case, it alternates with bájri. The seeding shows that the main object was fodder. The average rate of seed for the different varieties of jowári is about 7 lbs. in this locality. The land was manured with about 3 loads per acre. The land is evidently good; the tillage was careful. It was ploughed with the large plough (6 bullocks), and harrowed with the heavy harrow (4 bullocks). It was twice weeded with the bullock-hoe and afterwards hand-weeded. The soil was red (támbda mál). The yield in grain was good, but the weight of the bundle being undefined, the proportion between straw and grain is not clear. The seed was sown by the 4-coulter drill on 6th June, *i. e.* in good time.

2. The number of canes to provide sets for an acre of sugarcane appears insufficient. The formula gives the number for this táluka as 1,500. If sets are planted one foot apart and if the rows are 2 feet apart no less than 21,000 cuttings or sets per acre will be required. As no intimation is given as to the width of the rows and the distance between the sets, or the length of the canes and of the cuttings, the entry of column 5 cannot be checked. The yield of gul closely approximates the figure of the formulæ (6,000 lbs). The cost of cultivation is calculated to be Rs. 396, showing a loss of nearly Rs. 100 per acre. The causes alleged are (1) the extraordinary low price of gul, and (2) the greatly enhanced watering charges on account of lightness of the rainfall. But the cost of cultivation is over-estimated, as is shown in the body of the report.

The land is classed as garden and is irrigated from a well. The preparatory crop was chillies. The soil was good black. The seed was put in in March and the crop was cut in the following March. The number and weight of canes are required (*see* p. 26, Crop Experiment Report for 1883-84). The manure was sheep-dung and the ordinary manure of cow-dung, ashes and sweepings (*see* Note as to cost of cultivation).

3-6. Experiments Nos. 3 to 6 on wheat, dry-crop, unmanured, in an average season, represent the results on a soil of a mixed black and red variety. The maximum dry-crop rate of Karsul is Rs. 1-12; of Jánori probably the same. The formulæ give 800 lbs. as a 12-anna crop in Niphád and 810 lbs. and 315 lbs. for a 14-anna and an 8-anna crop in Dindori respectively. The low estimates of the Násik experimenters were referred to last year. The season certainly was less favourable to wheat than the former one. The estimates are still too low. The amount of seed per acre does not appear to be correct. No reason is shown why so much larger a seeding should be given in Dindori, nor is it shown why the yield in experiment No. 6 was only 8 annas.

7. A 12-anna crop for this táluka by the formulæ is 480 lbs. The value of the bhus is not included as it should be in column 8. The late rain is said to have favoured this crop, but the estimate of column 4 is excessive.

8. Variety of jowári not stated. Season very unfavourable. Rain late, followed by long breaks, and then by a heavy fall in October. The jowári was sown with math (Kidney bean), an estimate of the value of which is included in column 8. Soil, first rate black. Unmanured. Cultivation good. Field clean. The rotation is wheat, jowári and gram, with variations. The crop of the táluka was very bad.

9. Good black soil, clean. Manured last year for wheat, $5\frac{1}{2}$ carts of manure per acre. Sowing rain (October) favourable, but cold and heavy rain of December disastrous. The linseed and mustard were mixed.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per acre.					
				Seed.	Yield of		Total. Value of Produce.	Assessment, exluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principle Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
	KHA'NDESH—*contd.*			Lbs.	Lbs.		Rs. a. p.	Rs. a. p.	
	Mr. G. D. Pánse, Assistant Collector.								
10	Shirpur (Shingave) ...	Kharíf jowári.	12	3	585	207 bundles.	15 6 8	2 2 1	13·81
11	Chopda (Chopda) ...	Do. ...	12	3½	602	323 bundles.	15 14 8	1 7 11	9·39
12	Virdel (Pátan.)	Wheat, dry-crop.	14	54	945	?	22 8 0	2 0 6	9·02
13	Virdel (Sindkheda) ...	Gram ...	12	?	472	?	8 5 4 (grain alone.)	1 14 7	22·93
14	Do. ...	Linseed ...	10	12	287	...	13 5 4	1 14 10	14·45
	Mr. Shridhar Gundo, District Deputy Collector.								
15	Amalner (Mandal) ...	Kharíf ...	...	...	...	...	...	...	...
		Jowári ...	16	3	855	240 bundles.	20 10 0	1 6 1	6·69
		Mug ... (mixed also with tur and ambádi.)	...	⅓	42	Lbs. 27			
16	Amalner (Párola) ...	Gram ...	12	36	322	Lbs. 50	7 3 0	1 11 5	23·84
17	Do. ...	Wheat irrigated.	16	36	460	„ 100	8 12 0	1 5 7	15·42
18	Amalner (Udani) ...	Wheat, dry-crop.	12	48	310	„ 80	6 4 0	0 8 5	8·42
19	Chálisgaon (Mehunbára) ...	Linseed ...	4	15	140	...	4 6 0	1 3 9	28·21
	Mr. R. A. Lamb, Assistant Collector.								
20	Jámner (Jámner)	Túr (row crop) Cajanus indicus.	10	4	399	Lbs. 493 (leaves and pod shells).	12 15 3	1 15 7	15·24
21	Sávda (Sávda)	Bájri ...	14	11	525	Lbs. 2,154 (stalks.)	12 15 5	1 11 10	13·42

Central Division, 1884-85—continued.

	Remarks.
11	

10-11. Fair black soil. Clean. At Shingave manured; 1,000 sheep folded per acre for 7 days. Cost not stated. At Chopda the land was also manured but amount stated indefinitely. Season favourable though early rain scant. Seeding very low. The formulæ give 1,040 lbs. as a 12-anna crop. Cultivation careful as evinced by the absence of weeds.

12. Good black soil and clean. Manured with farm-dung and by sheep-folding. The figures for column 7 are not clear. The formula gives 900 lbs. as a 14-anna crop. Season very favourable.

13. Fair black soil. Manured. The figures for column 7 are not supplied and so column 8 does not include the value of the bhus. Column 10, percentage high. It is stated that the season was favourable, and though expressly stated that gram was the sole crop of the year, the low return appears to point to an earlier crop. The seed is put at 40 tolás per acre. Probably 40 lbs. are meant.

14. Fair black soil. Manured. Late rains damaged the crop very much. It is excessively liable to rust from this cause.

15. Jowári sown at rate of 3 lbs. per acre, mixed with 1 lb. of tur, ambádi and mug together. Land black soil, clean. Unmanured. Rotation, 3-year course, cotton, bájri and jowári. Column 8 includes the estimated value of the ambádi and tur (13 annas per acre). Season good on the whole. Sowing rain (June) insufficient, but July and September rains favourable. I hardly think that a crop which had not a very favourable rain throughout could be called a 16-anna crop, and the experimenter qualifies the statement by the words 16 annas *for the land*. Cultivation good, ploughed, bullock-hoed, and hand-weeded.

16. A late crop following bájri of the same season. Column 10 is calculated on the value of this second crop alone. The soil is light brown, but had sufficient moisture owing to the September rain. It was weedy and I have little doubt that the object of sowing the gram was chiefly to clean the land.

17. Black soil. Irrigated from a well. Water-rate combined with the soil-assessment in column 9. The crop was a second crop after bájri in the kharíf season. No manure. Season favourable.

18. Land very inferior and sandy, and not suitable for wheat, which indeed was only grown because the owner had not time to sow an early rain crop. Badly weeded. The September rain favoured the crop. Rotation 2-year course bájri and kulith. Clearly the land is not wheat land.

19. A second crop (rabí) following bájri (kharíf). Column 10 is calculated on the yield of linseed alone, which suffered much from late heavy rain. The heads were badly filled. Crop unmanured. Black soil. Cotton grown once in 3 years.

20. A row crop in land sown with cotton. Black soil, well tilled and partially manured. Sowing rain, late, which, however much it affected the cotton, did not appreciably affect the tur. It is not expressly so stated, but judging from other reports of this district it is clear that cotton was a very poor crop. It is interesting thus to know both the value of a row-crop where the principal crop is not good and also to have proof that the row-crop alone can bring the incidence as low as 15 per cent. The rotation is cotton and tur followed by jowári, and as is often customary, the rotation was exhibited on the field, part being under cotton and tur and part under jowári.

21. This is a test taken in connection with the special experiment reported in appendix C. The field has a well and is classed chiefly as garden. The well was not used this year. The assessment in column 9 is the average of the whole field. It is possible that a late garden crop was taken after the bájri, so that the incidence is not high, being calculated only on the one crop. The field is close to the village and receives considerable manure without direct application by the owner. Crop above the average of the village. Soil, a grey one requiring much water. The late rains were therefore very beneficial.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	AHMEDNAGAR.								
	Mr. C. H. Jopp, Assistant Collector.								
22	Sangamner (Sangamner)...	Wheat (dry-crop.)	10	37	288	415	5 12 9	1 11 5	29·56
23	Ráhuri (Belápur Khurd) .	Do. ...	12	44	457	773	9 13 3	1 3 0	12·08
	Mr. N. G. Deshpánde, District Deputy Collector.								
24	Karjat (Karjat)	Rabi, jowári (Dagadi).	8	11 jowári; 2 kardai.	130	454	4 2 8	0 4 0	6·00
	Mr. C. B. Winchester, Assistant Collector.								
25	Nevása (Salábatpur) ...	Rabi, jowári.	5	6 lbs. jowári; ¾ lbs. kardai.	118	1,405	5 5 5	0 6 11	8·09
26	Do. do. ...	Wheat (dry-crop.)	6	48 lbs. wheat and 1 lb. kardai.	323	427	7 4 1	0 9 11	8·54
27	Do. do. ...	Gram ...	5	60 lbs. gram and 1 lb. kardai.	340	80	6 5 8	0 11 3	11·06
	SHOLA'PUR.								
	Mr. E. L. Cappel, Assistant Collector.								
28	Sholápur (Kámti Khurd).	1 Rabi, jowári.	6	...	385	1,486	23 1 0	1 0 0	4·59
		2 Kardai ...	8	...	52	...	1 0 8		
		3 Gram ...	5	...	490	...	13 15 4		

Reports, Central Division, 1884-85—continued.

REMARKS.

11

22. Unmanured dry-crop wheat, following wheat of the two previous years. This is abnormal, and is due to the peculiarity of these two seasons, *viz.* a bad early rain, which prevented the alternation between kharíf and rabi crops. Tillage fair. The rain in December and January caused rust which affected the quality of the yield, so that whereas undamaged grain sold at 16 *sers* per rupee, the highest price offered for the sample of the experiment was Re. 1 for 20 *sers* (1 *ser* = 108 tolás). Kardai (safflower) was sown in rows. Its value is not included in column 8, but it was very scattered and thin.

23. Rich black alluvial soil, but not close to a large market as was the case of experiment No. 22. Unmanured dry-crop wheat following wheat of the previous year, but in 1882-83 bájri was taken in the kharíf season. Field marred with patches of hariáli. The sample was rusted and sold at 18 *sers* per rupee when the price of similar undamaged wheat was 16 *sers*. Kardai was interspersed with the wheat as in the experiment at Sangamner.

24. Jowári and safflower mixed. Value of latter not included in column 8, but it was very poor. Rain insufficient and unseasonable. The late rain in October (Hast), on which the rabi crops chiefly depend, was very poor. Heavy rain in December was no compensation. The field of experiment showed considerable variety of soil, but the assessment shows a very low rate which points to the undoubted fact that the field is more suited to an early than to a late crop. Thirty gunthás were reaped in 5 patches. The area was ample; 106 tolás of jowári is taken as the equivalent of 1 *ser*.

25. Light soil, "barad," more suitable for early than late crops; unmanured. Season abnormal as in Mr. Jopp's tálukás. The absence of the Hast rain (October) more harmful to jowári than to wheat. Crop here and there attacked with smut. Kardai was very poor. Its value not included in column 8; 1 *ser* jowári taken at 101 tolás.

26. Unmanured light soil wheat. Season more favourable to wheat than to jowári. No rust apparently. The kardai was very promising but not ripe. Its value omitted in column 8.

27. Unmanured. Following wheat for 2 years. Kardai omitted in column 8. The bhus of the gram only entered in column 7 and this is correct. The woody stems are not a useful by-product.

28. Jowári and kardai (in rows) were sown in the greater part of the field of experiment, one of good black soil unmanured. Gram covered an area of 3½ acres. The mixture was tested by cutting 3 plots of 2 gunthás each. The gram by only one plot of two gunthás which is below the prescribed minimum. The figures reported are untrustworthy for column 5. Gram is said to have been sown at 9 lbs. per acre, which I think cannot be correct. The figure for column 10 has been obtained by calculating the value of gross produce in the whole field and then taking the percentage. Mr. Cappel says the produce is fairly representative of the dry-crop cultivation of the táluka in an unfavourable year. The season with unseasonable rain, and when the crops were only saved by the fall in December, is also said to be characteristic. If so, the results are not unfavourable. But I am perforce obliged to presume that the whole field was cultivated. This to my knowledge is seldom the case. I think the estimates of column 4 are too high, taking into count the general remarks made by Mr. Cappel. It must be noticed that the row-crop kardai alone paid the assessment, a result which cultivators usually count on. If it does not, it is generally because the principal crop is good and weakens the subordinate crop.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	POONA.								
	Mr. P. C. H. Snow, Assistant Collector.								
29	Khed (Ghoda)	Wheat (Bakshi) and spelt (Khapli) mixed.	12	72 90	1,133	873	29 2 8	3 14 0	13·28
30	Do. do. ...	Do. ...	9	Do.	781	700	20 6 8	0 13 0	3·97
31	Do. do. ...	Gram ...	12	59	985	433	20 13 4	3 6 9	16·42
	R. A. L. Moore, Assistant Collector.								
32	Indápur (Kalas)	Irrigated jowári.	12	15	2,080	5,344	67 0 0	0 13 4	1·24
33	Sirur (Malthan)	Sugarcane	12	12,500 sets or cuttings.	6,752 (gul.)	?	337 8 0	2 0 0	0·59

	Remarks.
11	

29-31. Experiments 29 to 31 were taken on second crops in high farmed alluvial garden land bearing two crops except when sugarcane is taken. Bájri and chillies are among the early crops, while wheat, spelt, gram, potatoes and lentils are named as the most usual second crops. No detailed information is given regarding the practice of manuring, but as the crops experimented on were manured at the rate of about 13 cart-loads per acre, it is presumed that the manure is not all given to the sugarcane but applied to each crop. The fields of experiments Nos. 29 and 30 adjoin. The former is classed as garden and assessed accordingly. The latter however is classed as jiráit but is irrigated from the well in the former. Both fields belong to the same man. The incidence of assessment is calculated only on the value of the single crop. To judge of it fairly the average incidence in experiments Nos. 29 and 30 should be considered. To experiment No. 31 the same remarks apply, except that the well only irrigates the one number. The special water-rate is included according to standing orders in the gross assessment. The seeding of wheat and spelt together seems very high. Mr. Snow intends to specify the rate only and means that when sown together the seed would be $(72+90)\div 2 = 81$ lbs. The yields are not high. The late rains were inordinately heavy and the crops suffered from rust in consequence, besides being otherwise deteriorated.

32. The land, black soil, is apparently classed as jiráit, but whether at the maximum rate on account of the well or not is not stated. The yield of irrigated jowári is no doubt high, but the figures appear altogether too high and I cannot look on the experiment as trustworthy.

33. This experiment too is doubtful; the formulæ give a 12-anna crop of sugarcane at 4,800 lbs. of gul Though, as stated, the crushed cane and dry under-leaves are used as fuel in boiling down the juice, there is a very useful by-product, *viz.*, the stripped fresh leaves and the tops.

SOUTHERN DIVISION.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Yield of			Total Value of Produce,	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
				Seed.	Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
	BELGAUM.			Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. Gurshidápa Virbasápa, District Deputy Collector.								
1	Athni (Kakamari) ...	Rabi or white jowári.	...	5	200 (grain.)	707 (kadbi.)	6 15 3	0 4 11	4·41
	Mr. J. J. Heaton, Assistant Collector.								
2	Chikodi (Hukeri)... ...	Early jowári with rows of tur and kulthi.	8	5 jowári 3½ tur.	299 (jowári.)	614 (kadbi and bhusa.)	Jowári 9 6 8		
			6	3 kulthi.	16½ (kulthi.)	26 (chaff.)	Kulthi 0 7 5		
							9 14 1	0 15 7	9·41
3	Belgaum (Belgaum) ...	Rice Antarsál.	12	80	1,670 (paddy.)	2,596 (straw.)	52 8 10	7 1 4	13·48
4	Belgaum (Tadsinál) ...	Peas Pisum sativum (Vátána.)	4	...	140	432	3 12 0	3 6 1	90·14
5	Chikodi (Chikodi)	Sweet potatoes, convolvulus batata, red and white varieties.	12	70,000 to 100,000 cuttings per acre.	11,655 of roots or 5 tons.	Not weighed.	76 2 6	4 15 4	6·51
6	Chikodi (Chikodi) ...	Betel leaves or leaves of the vine (Piper betel.)	16	7,000 to 8,000 vines per acre.	4,347,000 leaves weighing 7 tons.	Do.	525 0 0	0 13 4	0·16
	DHA'RWA'R.								
	Mr. J. C. Anding, District Deputy Collector.			Lbs.	Lbs.	Lbs.			
7	Dhárwár (Mugud) ...	Rice ...	12	92	2,017 (paddy.)	2,713 (straw.)	42 14 8	5 3 8	12·18
8	Ron (Kotbal)	Wheat (dry-crop.)	8	?	177 (grain)	227 (straw.)	6 5 1	0 11 1	10·96
	Mr. J. Fairlie Muir, Assistant Collector.								
9	Kalghatgi (Kalghatgi) ...	Rice (Somsál.)	12	77	2,115 (paddy.)	2,472 (straw.)	46 11 8	5 15 0	12·71

	Remarks.
11	

1. Unmanured, lowly assessed land. Cotton usually alternates with jowári. Season unfavourable. Crop cut in 2 patches. One yielded 3 times as much as the other. Anna valuation not given.

2. Soil varying. Half masári or red. Rest red stony and good black. Experimental test gives average of the portion of field sown with the mixture of column 3. Manure 1 large cart-load per acre. Grain yield of jowári high compared with the straw for which season less favourable. This is a marked characteristic of the year. The tur not tested is estimated as equal in value to the Kulthi. The incidence is calculated on the produce including the tur.

3. This experiment is on the rich rice land near Belgaum, though not on the best or most highly assessed, for the crop depends on percolation only from a tank. Sown in July, 3 weeks late. Manured $3\frac{1}{2}$ cart-loads per acre. Very carefully cultivated. Land good red. Rainfall late. The crop was below average height. Rice is grown continuously and always a second crop of peas, lentils, wheat or mustard is secured. Incidence calculated on value of 1st crop only. Taking value of 2nd crop of peas at Rs. 10, the incidence is estimated at 11·32 per cent.

4. 2nd crop after rice on land greatly inferior to that of experiment No. 3. Crop excessively bad, cultivation indifferent. Rice crop manured. Seed given at 130 lbs. per acre or nearly as much as the yield. The incidence is calculated on the crop of peas alone.

5. Garden land irrigated from a well. Crop followed *tág* or Bombay hemp ploughed in as a green manure. The tág was also manured at the rate of 20 cart-loads per acre. Soil gray sandy *masári*. Rotation quite irregular as is generally the case in garden land, but sugar-cane is sometimes grown. The sweet potatoes were sown in rows 13 to 14 inches apart and the plants were from 4 to 6 inches from one another in the rows.

6. This experiment on the cultivation and yield of betel leaves in a *pán* garden is fully reported. The land is heavily manured after a preparatory crop of chillies or Bombay hemp reaped not ploughed in has been taken. The crop is put at 16 annas but by this evidently an average crop is meant.

7. Rice grown under a tank. Manured but rate not clearly specified. Not transplanted.

8. Wheat with rows of safflower. Proportion not stated. Seed given at 23 lbs. per acre which is too low.

9. Rice drilled with a 6-coulter drill on land yearly growing rice and on the low-lying portions a second crop of pulses. The incidence of column 9 is calculated on the first crop only. The rate of assessment is that of the land classed as rice land. Soil munjál, black and red mixed. 3 large cart-loads per acre of ordinary manure consisting of cattle droppings, rotted leaves and sweepings of house and byre. Quantity considered to be half what was requisite. Manure put on in May after ploughing, and harrowed in. Season average.

Summary of the Crop Experiment

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of gross Produce.
					Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
	RATNA'GIRI.			Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. W. Doderet, Assistant Collector.								
10	Sangameshvar (Vándri)...	Early rice (Panvel.)	16	80	1,905 (paddy.)	3,547 (straw.)	...	4 1 4	...
11	Do. do. ...	Late rice (Panvel.)	8	160	1,040	1,693	...	3 3 3	...
12	Ratnágiri (Parchuri) ...	Early rice ...	13	100	1,731	5,130	...	3 15 2	...
13	Do. do. ...	Do. ...	12	100	1,497	4,253	...	5 14 1	...
14	Do. do. ...	Late rice ...	16	100	2,040	3,891	...	6 8 8	...
15	Do. do. ...	Do. ...	16	80	1,853	4,406	...	7 1 9	...
16	Do. do. ...	Early náchni (Eleusine corocana.)	14	6½	426 (grain.)	2,073	14 14 4 (grain.)	0 5 0	2·10
17	Do. do. ...	Late Do. ...	13	17	660	1,280	23 2 6 (grain.)	0 4 0	1·07
18	Do. do. ...	Late varai (P. Miliare.)	13	15	533 (grain.)	...	18 10 11	0 4 11	1·64
	Do. do. ...		13	15	506 (grain.)	...	17 11 11	0 3 11	1·38
	Mr. C. P. B. Wiltshire, Assistant Collector.								
19	Chiplun (Peve)	Early rice (Panvel.)	12	...	1,886 (paddy.)	2,740 (straw.)	43 1 5	4 7 11	10·43
20	Do. do.	Do. (Patni.)	12	...	1,952	3,653	46 1 3	3 3 9	7·02
21	Chiplun (Marg Támáne)...	Do. (Chimansál.)	12	...	1,193	1,793	22 9 8	1 2 10	5·21
22	Do. do. ...	Do. (Sonphal.)	4	...	140	233	2 5 3	0 6 10	18·34
23	Do. (Ambere Budrukh)	Late rice (Patni.)	12	...	1,905	4,647	37 10 9	3 12 5	10·02
24	Do. do. ...	Do. (Bhadas.)	12	...	1,093	1,760	20 9 5	3 1 0	14·87
25	Do. (Páthardi) ...	Late rice (Patni and Varangal.)	12	...	1,413	2,567	26 10 1	3 7 4	12·99
26	Do. do. ...	Do. (Varangal.)	12	...	1,471	1,867	26 8 5	3 7 10	13·16
27	Do. (Mallan) ...	Do. ...	16	...	2,164	2,883	46 6 4	4 12 6	10·31
28	Do. do. ...	Do. ...	12	...	1,594	3,275	35 11 1	4 8 9	12·74

	Remarks.
11	

10—15. Experiments 10—15 on rice raised from rabed seedlings, except in experiment No. 11, where it is stated that no manure was used by which it is presumed that the seedlings were raised by one of the substitutes for ráb. The soil in No. 10 was the best black. In No. 11 it was a poor red. Elsewhere it was red. Season favourable in all. The amount of seed is entered as reported, but no intimation is given as to how it was calculated.

16—17. Náchni from rabed seedlings The rotation is, 1 náchni, 2 varai, 3 harik, 4 til or udid, and then fallow for 3 to 5 years. The incidence is that calculated on the best crop of the rotation without making any allowance for fallows and is therefore incorrect, if the rotation is not taken into consideration.

18. Rotation as described above. The incidence is calculated on one of the subordinate crops of the rotation The varai is raised from rabed seedlings. Season very favourable.

19. Rabed marsh land. Season not favourable. Local estimate considered by experimenter too high. Cultivation good. No weeds. The land was washed by salt-water from a creek which flooded the field.

20. Rabed. Early rain scant, but season favourable. Red soil. Cultivation good, no weeds.

21. Rabed. Red soil. Season favourable but cultivation bad. Field very weedy.

22. Not rabed, but a little cowdung put on as a top dressing. Rocky red soil; cultivation bad. Field very weedy. The land is really *varkas*.

23. Rabed. Black low-lying soil. Early rains scant but season favourable. Field very weedy. Insufficient ráb.

24. Rabed reddish soil. Season favourable, but field very weedy indeed.

25. Rabed. Low-lying black soil. Season favourable. Cultivation bad. Field weedy.

26. Rabed. Low-lying black soil. Season favourable. Cultivation fair, but in about half area weedy. Ráb insufficient.

27. Rabed. Low-lying black soil. Season favourable. Cultivation bad.

28. Rabed. Low-lying black soil. Cultivation very bad, extremely weedy. Crop below average of similar lands. Season not favourable.

APPENDICES.

APPENDIX A.

Memorandum referred to in paragraph 8 (page 2).

Mixed Survey Numbers.

1. In columns 5 and 6 where a survey number is assessed partly as rice or garden land and partly as dry-crop, the area and assessment of each variety should be clearly shown. The average assessment per acre (column 26) should be calculated on the class of land dealt with in the experiment.

The local name, columns 10 and 13, is to show the variety.

2. *Column 10.*—The local name is required to *show the variety.* Therefore such vernacular names as "gahu" for wheat or "bhatta" for rice are of no use. What is required is the name which shows the variety of wheat or rice experimented on. So in column 13 the local name is to show the variety of the soil.

Manure to be shown per acre.

3. *Column 15.*—The amount of manure *per acre* should generally be shown. (*See* remarks, page 7).

Mixed Crops.

4. *Column 10.*—The yield of wheat or other crop cannot be exactly the same when it is sown alone, as when it is only one ingredient in a crop mixture. The explanatory remarks on this column have not been carefully attended to.

The actual test required by column 19.

5. *Columns 18 and 19.*—The actual test must necessarily be made in every experiment and with every crop experimented on (*see* pages 8-9, where an additional rule regarding the test is given). Experimenters are warned against the use of spring balances. These are not sufficiently accurate to weigh grain.

Values of crops not to be calculated by Price Currents.

6. *Column 21.*—Experimenters are not authorised to accept the prices recorded in the Price-Currents published in the *Government Gazette* for the purposes of entering the money value of the crop (*see* pages 17-18).

Weight of by-products required.

7. *Column 20.*—The *weight* of useful by-products should invariably be given and not merely the number of bundles of straw and the like (*see* page 7).

Areas of experiment to be measured.

8. *Column 9.*—Experimenters are not intended to accept the areas recorded in Village Form No. III. as correct (*see* page 8). All measurements must invariably be made with chain and cross staff and not with tapes.

Weight *ser* and capacity *ser*.

9. *Column 18.*—The weight *ser* and the measure *ser* are not to be confounded. Where the weight *ser* is customary as in Gujarát, the word weight should be substituted in column 18. It seems hardly necessary to say that the weight of the contents of the measure *ser* varies with the grain.

Calculation required for seed per acre.

10. *Column 16.*—The reports nearly all give an unexplained figure for this column and frequently the figure is so manifestly incorrect that it has been omitted by me. The rayat does not measure his land by acres or calculate his seed per acre. It is unsafe to use the accepted equivalents for *bighás* and other native land measures. The best way I know of ascertaining the amount of seed per acre is to ascertain the amount sown in the field of experiment and measure the area.

Ordinary and special experiments.

11. *Ordinary and Special Experiments.*—It is impossible to show the difference between these two classes of experiments more clearly than has been done in the rules; and yet throughout the reports—with one or two marked exceptions—a strange confusion exists.

12. Sufficient care is not taken to ascertain whether the crop of experiment is the only one raised on the area of experiment or not. Naturally the assessment levied on the land takes careful count of the capability of the land, and to calculate the incidence of assessment on land capable of being twice cropped, without clearly specifying this capability, is misleading.

Double-cropped land.

13. Attention is specially drawn to the deduction in special experiments of the unsown portions of arable land (*see* Mr. Heaton's and Mr. Fairlie Muir's experiments in the Appendix). It is not important when the rate per acre of outturn is being calculated (ordinary experiment), but is very important when the outturn of each crop in a holding is being estimated.

Unsown portion of arable land.

14. Experimenters are requested to use the printed forms in making reports. Much labour will be saved and the results exhibited in a readable form.

E. C. OZANNE,
Director of Agriculture.

APPENDIX B.

Special Experiment by Ráo Bahádur R. K. Vaidya, referred to on page 4.

The holding selected was a survey number measuring 3 acres 5 gunthás assessed at Rs. 9, on which yearly an early crop of maize and a late crop of wheat or gram are taken.

Experiment No. 27 in the tabular statement shows the details of the special test taken in connection with this enquiry. In order to estimate the yield of the maize in the kharíf season, Mr. Vaidya chose one of Mr. A'darji Jivanji's maize experiments in an adjoining village on similar land and generally grown under similar conditions. The experimenter had three separate tests made by Mr. A'darji to guide him as regards the kharíf crop, while for the rabi crop he had alreay made 4 ordinary experiments on the crops of wheat and gram following maize.

The size of the holding appears small, but it is fairly argued that the land is always double-cropped, so that it is really equivalent to a holding of twice the area once cropped.

The size of the test area, 10 gunthás (for the wheat) was sufficient.

The whole field was sown with maize and with wheat in its turn.

Gross Produce.

1. *Maize.*—On land assessed at Rs. 2-4-7 per acre, consisting of gorádu (sandy loam) and káli (black soil), manured at the rate of 1½ cart-loads per acre, cultivated by a farmer who holds 8 acres of land, Mr. A'darji found the maize yield at 981 lbs. of grain and 1,050 lbs. of stalks. The selected holding for the special experiment consisted of land assessed at Rs. 2-14-1 per acre, in character a sandy loam (gorádu), on which 10 loads per acre of manure had been put in May and cultivated by a small farmer. The rotation in both holdings was identical. Both were under similar conditions of rainfall, climate and soil. If anything the more heavily mannured maize crop on the selected holding must have been heavier than that on Mr. A'darji's test. *Wheat* was directly tested. The yield was slightly diminished by excessive rain which injured the late crops on deep lands, such as those like the selected holding. The test showed a yield of 848½ lbs. of grain and 776 lbs. of straw.

The experimenter kept throughout on the safer side and his estimate cannot be charged with exaggeration.

Gross produce therefore on 3 acres 5 gunthás :—

		Grain.		Straw.
Maize	Lbs.	3,066	Lbs.	3,280
Wheat	„	2,652	„	2,425
Total ...	„	5,718	„	5,705

Conditions of the holder.—The holder, a Rával by caste, cultivates this land only and subsists on the profits thereof. He has a wife, a son, a daughter-in-law and a grand child. He owns a plough and one pair of bullocks and 2 she-buffaloes. He purchases no manure. He uses only what his cattle produce, which is sufficient. Hired labour was employed (1) for weeding the maize by hand, and (2) for pulling the wheat only. Cattle were borrowed from relations to thresh the wheat, but the holder re-paid the loan by the loan of his own cattle in return. Carrying the crop necessitated the borrowing of a cart, for which no doubt an equivalent was given without expenditure of grain or cash. Maize-seed was in store from the previous year's crop, but wheat-seed was obtained from the Sávkár on payment at harvest of 1½ times the amount. The payment to village servants amounted to 130 lbs. maize and 50 lbs. wheat, with Re. 1 in cash to the carpenter. The cattle and she-buffaloes were fed on the home-grown straw chiefly, but the bullocks cost Re. 1 for gram in the ploughing season. The holder paid Re. 1 for grazing on land, the usufruct of which had been purchased in auction by a villager who partitioned the cost among the rayats. A new plough

is yearly made up. The materials cost Re 1. The cost of making is covered by the payment to the village Balutedárs. The food of the family calculated at 1½ lbs. per adult and 1 lb. per child per diem, half in maize and half in wheat, fairly covers according to the experimenter's opinion and the holder's assent the food of the family, including condiments and tobacco.

Full details are now available for the next step in the calculation. The hired labour for pulling wheat, it must be added, was paid in grain. Eight men received each 2 sheaves, giving 3 lbs. wheat each.

Expenditure in Grain.

	Wheat.		Maize.	
Seed	Lbs. 600	Lbs.	60	The wheat seed includes the interest on the loan.
Customary dues	„ 130	„	50	
Food for family	„ 1,200	„	1,200	
Grain wages for havesting wheat.	„ 48	„	...	
Total ...	„ 1,978	„	1,310	

Deducting this expenditure from the gross produce there remain—

(1). Wheat 674 lbs., (2). Maize lbs. 1,756.

	Rs.	a.	p.
The cash value of wheat at 53 lbs. per Rupee ...	12	10	0
Do. of maize at 58 lbs. per Rupee	30	3	0
Total ...	42	13	0

Expenditure in cash.

	Rs.	a.	p.
Weeding maize 3 hired men at 1¼ annas a day for 15 days	3	8	0
Cash to carpenter (Re. 1 Bábásái)	0	13	6
Gram purchased for plough cattle	1	0	0
Grazing...	1	0	0
Cost of materials for plough (Re. 1 Bábásái) ...	0	13	6
Depreciation of live-stock 10 per cent. on prime-cost, Rs. 60 Bábásái	5	1	0
Local Fund cess	0	9	0
Total ...	12	13	0

The net result is a profit of Rs. 30. Of this Rs. 9 are paid to Government as assessment and Rs. 21 remain to the occupant after having paid all charges, including the value of his labour and that of his family and the keep of two she-buffaloes. Out of this has to come clothing and luxuries. It is not stated whether the occupant is in debt or not. Mr. Vaidya valued the manure produced by the buffaloes (15 loads at annas 4 each) and added the value to the cash expenditure. This was no doubt correct. I have, however, taken count of this fact in the final deduction made, which may be thus expressed. One acre of good dry-crop land in this locality can in a fair season support an adult or two children with a fair standard of comfort.

APPENDIX C.

Special Experiment by Mr. R. A. LAMB, referred to on page 11.

Holding of Náru valad Gaba at Sávda in Khándesh.

Crop.	A.	g.	Remarks.
Bájri	0	28	Survey No. 454.—Outturn calculated by actual test on plot of 13 gunthás. (*See* experiment No. 21 in the statement).
Do.	0	7	Survey No. 444.—Classed dry-crop but irrigated.
Jowári...	2	8	Survey No. 361.—Medium black soil. Land partly classed as bágáyat but not irrigated. Well out of repair and in disuse. Seed 12 lbs. per acre. Sowing at the end of June (Á'radra). Rather late. Rain late.
Do.	0	19	Survey No. 424.—Medium black soil. Dry-crop. Manured, 10 carts per acre. Sown with tur broad-cast. Area estimated as equally divided between the two crops.
Do.	0	33	Survey No. 425.—Soil black but mixed with gravel and lime nodules. Dry-crop. Sown with the *tiphan* (3-coulter drill) with rows of tur. The jowári was put in at the rate of 8 lbs. to 4 lbs. of tur. Mr. Lamb divides the area according to the seed. Here is a mistake. Tur is the larger seed and the plant spreads. It would have been better to divide the area according to the rows. Jowári 3 rows, Tur 1 row. Therefore Jowári should have been credited with ¾ the area.
Tur	0	36	In Survey Nos. 424 and 425.
Wheat—			
Dry-crop	0	37	Survey No. 437.
Irrigated	0	22	Survey No. 444.—Manured.
Ground-nut	1	0	Survey No. 444.—Irrigated and manured.
Linseed	3	0	Survey No. 444.—Dry-crop.
Uncultivated	1	21	Fallow and uncultivable.
Total ...	12	11	

I have attempted to omit details, which will be quoted in full from Mr. Lamb's report below. In Survey Nos. 425 and 437, the holder of the holding under consideration has no allotted marked-off share, but cultivates it in common with the other sharers. "Each is expected to contribute his share of labour. If he fails, the value of what he has failed to contribute is deducted at the division of the crop."

I now transcribe the remainder of Mr. Lamb's report :—

Usual Rotation.

1. Rotation is not strictly defined, but generally is as follows :—

A kharif crop and a rabi crop in alternate years, subject to the following exceptions :—Jowári or bájri (kharif) may be grown for two years in

succession on the same land. Gram (rabi) is not grown more than once in 5 or 6 years on the same land.

Fallow is given only when the cultivator has not the means to cultivate his plot.

Wet-crop is extended or diminished according to means, without reference to rotation; but in No. 444 the wet-crop plots are shifted about each year.

2. As regards actuals, Village Form No. III. is useful as showing what crops were grown in the whole field, but useless to show what was the crop on the particular plot under experiment. Náru simply does not know what crop he grew in his plots in Nos. 361 and 424 two years ago. Village Form No. III. says a kharif crop (jowári) in the first, and cotton in the second.

Season.

3. *Survey No. 361.*—Náru has 3 patches here; the crop in one is decidedly poor, in the second somewhat better, in the third very fair. The estimate, 9 annas, is the average of the three patches. It is below the average crop of the village, which is about twelve annas. The cause I take to be inefficient cultivation.

Survey No. 424.—Average crop.

Survey No. 454.—*See* Experiment No. 21 in the statement.

Survey No. 444.—Bhuimug crop below average, owing to poor soil and inefficient cultivation.

Survey No. 425.—Below average; cultivation indifferent.

4. Regarding the rabi crops and the wet-crops—wheat, no estimate could be formed at the time of experiment (4th November), as the crops were only just springing. Subsequently, in February, they were estimated, considering the soil, cultivation and season—linseed 12 annas, wheat (dry) 14 annas, wheat (wet) 12 annas. The estimate of tur is rather rough, as the plants were still flowering in November.

Character of Cultivation.

5. *Survey No. 361.*—Of Náru's three plots the first was badly cultivated, and overgrown with *hariáli*; the second was somewhat better, but far from good; the third fair, being comparatively free from grass and weeds. But the land is said to have had no manure applied to it for many years.

Survey No. 424.—Náru's plot clean and well weeded; manured this year. Cost Re. 1 per cart.

Survey No. 454.—There was a certain amount of *hariáli*, but not much, considering the heavy rainfall.

Survey No. 444.—Ground not so well kept as it should have been. Much grass at borders of bándhs and pot-bándhs.

Survey No. 425.—Large portions of this field are given up to *hariáli* and *kunda*, bearing no crop. No manure has been used for years.

Survey No. 437.—This land having been recently sown was cleaner at time of experiment than No. 425; but like that No., had not been manured. About $\frac{3}{4}$ acre was left under grass.

Seed.

6. *Survey No. 361.*—Two *chauthas* (8 *sers*) are said to have been sown on the whole piece, 2 acres 8 gunthás. This gives $3\frac{7}{11}$ *sers* per acre. Taking the *ser* at 135 tolás (*see* my Jowári Experiment at Ráver in 1881-82, page 66 of Central Division Reports, printed as Accompaniment to Government Resolution No. 6752, Revenue Department, dated 12th September 1883), this gives $12\frac{1}{4}$ lbs. per acre. This quantity is $22\frac{1}{2}$ per cent. higher than that fixed by Mr. Whitcombe, as required in Sávda Táluka, *viz.*, 10 lbs.

Survey No. 424.—Three *sers* of tur and 4 of jowári are said to have been used. Taking the tur at 3½ lbs. a *ser* and the jowári at about the same (as above), the amounts come approximately as those given (jowári 6½ lbs. and tur 5 lbs.). Mr. Whitcombe gives 6 lbs. jowári and 2 lbs. tur only. The latter quantity may be right where tur is sown in a few rows only; in this case it was sown broadcast over the field.

Survey No. 454.—One *chautha* (4 *sers*) is said to have been used by Náru and his partner Motirám on their plots of (about) 1¼ acre. This gives, at 140 tolás the *ser* (about) 11 lbs. an acre—a high but not I think too high a figure. Mr. Whitcombe gives 8 lbs., which I consider much too low.

Survey No. 444—(1) *Wheat*, irrigated. 16 *sers*, 3½ lbs. each, sown on 33 gunthás. The result comes very close to Mr. Whitcombe's figure—68 to his 64. (2) *Bhuimug*. 55 local *sers* planted on 2 acres. To convert into pounds, I have calculated from Mr. Sáthe's Sátára Experiment in Bhuimug in 1882-83 (page 95 of Accompaniment to Government Resolution No. 307, dated 12th January 1884). The result (75 lbs.) is 25 per cent. above Mr. Whitcombe's figure (60 lbs.), which is probably the more correct one. (3) *Bájri*. As above. (4) *Linseed*. Three *chauthas* (12 *sers* of 3 lbs. each) on 3 acres. Mr. Whitcombe also gives 12 lbs. an acre. (*See* my Linseed Experiment at Sávda, page 69, *ubi supra*).

Survey No. 425.—Figures given by cultivator:—30 *sers* jowári, 15 of tur for the whole piece. These give 8⅔ lbs. of jowári and 4⅕ lbs. of tur per acre.

Survey No. 437.—120 *sers* (=420 lbs. as above,) to the whole field that is 46 lbs. per acre. Mr. Whitcombe allows only 32 lbs. an acre for dry-crop wheat, which is certainly too low. (*See* Mr. Ardesar Jamsetji's Dry-crop Wheat Experiments in 1881-82, page 54, *ubi supra*, where 48 *sers* (=168 lbs.) sufficed for 2 acres 17 gunthás only, *i.e.* 69 lbs. per acre; also Mr. Alcock's Experiment in 1882-83, which gives exactly the figure I now give—47 lbs. an acre, page 8, Accompaniment to Government Resolution No. 307 of 1884; *see* also Khándesh Gazetteer, page 150, where the allowance of seed is said to range from 45 to 75 pounds).

Calculation of Outturn.

7. I have now to estimate the acre outturns of crops not directly experimented on; to take in and let out the coat (if I may adopt Mr. Stewart's 'homely illustration,' page 2 of Accompaniments to Government Resolution No. 307 of 1884) and so make as well fitting and pretty a coat as I may be able. The illustration halts a little, seeing that I have to take in and let out from measurements made by other tailors than myself, and for other wearers than Náru valad Gaba; whereas the tailor has his own measurements to manipulate, and not more than one customer to fit any particular coat to. Thus I fear my coat will be but patchwork after all. It is at any rate clear that in applying the results of other experiments to the holding under experiment, one departs from the plan of recording facts ascertained with as close an approach to accuracy as possible by painstaking and laborious personal observation and introduces freely an element of judgment—or more correctly, guesswork—which it had previously been the object to reduce to a minimum.

8. *Survey No. 361.*—Jowári, a 9-anna crop, on soil assessed (exclusive of water, which is not used) at Rs. 1-13-6 an acre, cultivation mostly indifferent, manure none, season too wet. For this crop, I will take my own measurements, recorded in my experiment at the neighbouring town of Ráver in November 1881 (page 20, Central Division Reports, Government Resolution No. 6752 of 1883). There I find nothing said as to outturn in annas, but the crop was not abnormal (page 66); so that probably it was an average or 12-anna crop. Assessment was Re. 0-15-10½ an acre; cultivation ordinary; manure none; season favourable and the produce (38 *sers* on 6 gunthás) 253⅓ *sers* per acre (or 886 lbs., Mr. Whitcombe gives 870 lbs. as a 10-anna crop). Considering that the land is much better, the cultivation rather worse and the season much worse than in the Ráver case, it will perhaps be a close estimate to put the outturn here at 192 *sers* or 672 lbs. (a little short of Mr. Whitcombe's 9-anna crop—700 lbs). The value of this at Sávda on 10th December was Rs. 12

The Kadbi at Ráver was 25 bundles on 6 gunthás or 167 bundles per acre. Adopting the same proportion as in the case of the grain we should get here 125

bundles, worth (at Rs. 3-4 a 100, the Mámlatdár's *nirakh*) Rs. 4-1. Hence the outturn per acre would be Rs. 16-1 (leaving the ambádi out of account as too insignificant).

9. *Survey No. 424.*—Here also the ambádi may be left out of account.

Jowári and tur, 12-anna crops; rate per acre Rs. 1-13-6; season too wet; cultivation good; manured. Here again I will refer to other experiments of my own—the 1881 Ráver Experiment (as above) for jowári and the accompanying one for tur (No. 20 in the Statement). Here the jowári ought to be better than at Ráver, notwithstanding the disadvantage of too much wet, because of the better soil and the better cultivation. It must be borne in mind, however, that excessive wet tells more against the good heavy soils than against the light poor ones. On the other hand, on a well manured field, plentiful moisture is necessary. Mr. Whitcombe reckons a 12-anna crop of jowári in Sávda at 1,120 lbs. (320 *sers*); I consider this very high, and should prefer not to estimate the outturn here at over 1,050 lbs. (300 *sers*) an acre. So also the kadbi must be taken as 200 bundles. Values at prices as above will be Rs. 18-12 and Rs. 6-8 an acre.

At Jámner this year my tur was a 10-anna crop on land assessed at Rs. 1-15-7 an acre; season fair; cultivation fair. At Sávda the land and season were not so good; the cultivation better. My 400 lbs. an acre in Jámner are what Mr. Whitcombe calls a 9-anna crop. I will take a little less than his figures for an 11-anna crop as applicable to this Sávda field, *viz.*, 560 lbs. (160 *sers*). The pods, &c., must then be reckoned as 700 lbs. The Mámlatdár's *nirakh* for December shows no tur in market; taking the price in Sávda to be the same as in Jámner, we have values per acre: grain Rs. 11⅔, fodder Rs. 7.

Jowári and tur were sown together broad-cast in the field, and as the seed shows, in, roughly speaking, equal quantities. The acre outturn will therefore be arrived at by taking ½ acre jowári and ½ acre tur. Thus:—

		Rs.	a.	p.
½ acre Jowári	Grain	9	6	0
	Kadbi	3	4	0
½ acre Tur	Pulse	5	13	4
	Pods, &c.	3	8	0
	Total ...	21	15	4

10. *Survey No. 454.*—These are actuals and require no comment. The price at time of experiment was Rs. 13 a *máp*; on December 10th (Mámlatdár's *nirakh*) Rs. 15 a *máp*.

11. *Survey No. 444.*—(1) *Wheat* (irrigated). I will take my own measurements once more. (Sávda Experiment, 1881-82, pages 20 and 70, *ubi supra*). Then the crop was 1,100 lbs. an acre (just over 12 annas according to Mr. Whitcombe's figures), on land assessed at Rs. 1-7 an acre; cultivation good; no abnormal damage occurred. Here the crop is perhaps 12 annas; land rate Rs. 1-10 an acre; cultivation fair; no abnormal damage. More manure was used in that case than in this. Other things being equal, the inferiority in manuring will quite cancel the superiority of soil; and (concurring with Mr. Whitcombe's figures) I think the outturn in this case should be taken as no higher than in my former experiment, *viz.*, 1,100 lbs. or 310 *sers* an acre; worth on 10th January 1885 Rs. 14 a *máp*. The straw would, as there, be worth Rs. 5 an acre. (2) *Bhuimug*. I must again trust to Mr. Sáthe. He found on the whole a fair crop (perhaps a little under the average, say 10 annas); land assessed at Rs. 1-12-10 an acre; rather under 5 carts per acre of manure used; cultivation otherwise and season not remarked. Here I have a 10-anna crop; land assessed at Rs. 1-10 an acre; rather over 5 carts per acre of manure used; cultivation fair and crop unaffected by season. It is obvious that here the conditions are very nearly identical; Mr. Sáthe's soil was superior to mine, but then mine got rather more manure. He found 3 gunthás produce 170 lbs. of nuts; the straw is valueless except as fodder (and not much at that); the acre outturn being therefore 2,266 lbs., or, say, 2,250 lbs. This, Mr. Whitcombe's figures for Sávda

would show as just about a 10-anna crop. I shall take it as the outturn for my field; the price on 10th December was Rs. 1-8 a *man* of 40 *sers* (80 lbs.). (3) *Bájri.* The rates here must follow those in the plot experimented on. (4) *Linseed.* Here again I have an experiment of my own in the same village to refer to (pages 20, 68, 69, Central Division Reports, 1881-82). I had then an outturn of 275 lbs. an acre (rather better than a 9-anna crop, according to Mr. Whitcombe), on land assessed at Rs. 1-11-7½; the cultivation was indifferent, and manure absent; the season too dry. Now the crop is perhaps 12 annas, the assessment Rs. 1-10 an acre; the cultivation fair, except that there was no manure; the season wet and favourable. It is fair therefore to assume that notwithstanding the somewhat insignificant inferiority of the soil, the outturn will be much greater now than it was in that case. It may, I think, fairly be taken at what Mr. Whitcombe gives as an 11-anna outturn, *viz.*, 360 lbs. (120 *sers*). The price of linseed on 10th January 1885 was (Mámlatdár's *nirakh*) Rs. 28 a *máp.* (In February when the new linseed is brought to market, it would of course be much lower). The chaff and stalks are valueless.

In filling in the averages per acre, I have had regard only to Náru's share, which is—

	A.	g.
Bhuimug	1	0
Wheat	0	22
Bájri	0	7
Linseed	3	0
Total cropped	4	29
Fallow and unculturable	1	21
Total ...	6	10

Thus to make up the average acre of his share, we must take—

			Rs.	a.	p.
4/25 acre	Bhuimug ...	... Nuts ...	6	12	0
8/25 „	Wheat ...	... Grain ...	1	13	0
		... Straw ...	0	6	5
1/25 „	Bájri ...	... Grain ... Straw ...	0	8	3
12/25 „	Linseed ..	... ...	8	6	5
0/25 „	Waste ...	... ...			...
1 „		Total ...	17	14	1

12. *Survey No. 425.*—I employ the same experiments of my own as above. The crops are jowári 10 annas and tur 9 annas at most; the season too wet; the cultivation bad; the land assessed at Rs. 1-11-6 an acre. The jowári will be less than in Survey No. 361; the soil and cultivation being both worse than in that field; say, 160 *sers*, 560 lbs. The tur is also barely a 9-anna crop and cannot be put at more than 350 lbs. an acre (100 *sers*). The kadbi will be 100 bundles, and the tur pods and leaves 437½ lbs. Prices as before. The proportion of jowári to tur in the field is as 2 to 1 (compare the seed); so that for the average acre we have—

			Rs.	a.	p.
2/3 acre	Jowári ...	... Grain... ...	6	10	8
		... Kadbi ...	2	2	8
1/3 „	Tur ...	... Pulse.., ...	2	6	10
		... Pods, &c. ...	1	7	4
1 „		Total ...	12	11	6

13. *Survey No. 437.*—I do not quite know what dry-crop wheat experiment to cut and measure by. Mr. Woodburn did one in Yával (in the same táluka as Sávda) in 1880-81; but though he calls it a 10 to 12-anna crop, the produce is only 250 lbs. an acre (pp. 24—25, Accompaniment to Government Resolution No. 776,

Revenue Department, dated 27th January 1883). I prefer to make deductions from Mr. Ozanne's experiment at Puntámba in Kopargaon (pp. 58—59, Crop Experiment Report for 1883-84). He had a 12-anna crop (I should have thought a 15 or 16 from the outturn) on 2nd class black soil assessed at Rs. 1-1-3 an acre; good cultivation without manure, and a favourable season. I have a 14-anna crop on medium black soil assessed at Rs. 1-13-6 an acre; fair cultivation without manure, and a favourable season. So that I have the better soil, but inferior cultivation; in other respects things are equal. Mr. Whitcombe gives 900 lbs. as a 14-anna crop in Sávda; and that is exactly what one of Mr. Ozanne's fields at Puntámba yielded. I think therefore that the outturn of grain of the field under notice may be taken at that figure; and the chaff at 1,000 lbs. The price of wheat on 10th January 1885 was in Sávda Rs. 14 a *máp*. The chaff would be worth about Rs. 2-4.

14. The next thing is to calculate (A) gross outturn, (B) expenses, cost of cultivation, and thence deduce (C) the net return; finally obtain (D) the incidence of assessment on the net return.

(A).—*Gross Outturn.*

(1). *Survey No. 361*—2 acres 8 gunthás, 672 lbs. jowári, 125 bundles kadbi per acre. Therefore outturn 1,478 lbs. jowári, 275 bundles kadbi.

(2). *Survey No. 424*—38 gunthás, outturn 525 lbs. jowári and 100 bundles kadbi, 280 lbs. tur, 350 lbs. pods, &c., per acre. Therefore outturn, 498¾ lbs. jowári, 95 bundles kadbi, 266 lbs. tur, 332½ lbs. pods, &c.

(3). *Survey No. 454*—28 gunthás, 525 lbs. bájri and 2,154 lbs. stalks per acre. Therefore outturn 367½ lbs. bájri and 1,508 lbs. stalks.

(4). *Survey No. 444*—

(i.) Wet wheat, 22 gunthás, 1,100 lbs. wheat and 20 head-loads chaff per acre. Therefore outturn 605 lbs. wheat and 11 head-loads chaff.

(ii.) Bhuimug, 1 acre, 2,250 lbs.

(iii.) Bájri, 7 gunthás, outturn, as above, 92 lbs. grain and 377 lbs. stalks.

(iv.) Linseed, 3 acres at 360 lbs. an acre = 1,080 lbs.

(5). *Survey No. 425*—

(i.) Jowári, ⅔ of 1 acre 10 gunthás = ⅚ of an acre, at 560 lbs. grain and 100 bundles kadbi per acre = 467 lbs. jowári and 83 bundles kadbi.

(ii.) Tur, ⅓ of 1¼ acre = $\frac{5}{12}$ acre at 350 lbs. pulse and 437½ lbs. pods, &c., per acre = 146 lbs. pulse and 182 lbs. pods, &c.

(6). *Survey No. 437*—37 gunthás at 900 lbs. wheat and 1,000 lbs. chaff per acre = 832 lbs. wheat and 925 lbs. chaff.

The total outturn of the holding is therefore (omitting the mangoes and the ambádi as too minute to reckon) as shown in the following statement:—

Outturn.

Survey Number.	Grain.						Fodder.			
	Jowári.	Tur.	Bájri.	Wheat.	Ground-nut.	Linseed.	Jowári. Stalks.	Tur Pods, &c.	Bájri Stalks.	Wheat Chaff.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Bundles.	Lbs.	Lbs.	Lbs.
361	1,478	...	...	...	...	...	275	...	...	...
424	499	266	...	...	...	...	95	332	...	...
454	...	...	367	...	...	...	...	...	1,508	...
444	...	...	92	605	2,250	1,080	...	...	377	900
425	467	146	...	...	...	...	83	182	...	...
437	...	...	...	832	...	...	...	...	...	925
Total ...	2,444	412	459	1,437	2,250	1,080	453	514	1,885	1,825

(B).—*Cost of Cultivation and Expenses.*

Náru valad Gaba has a wife and two small children; and he is separate from his other relations. He and his cousin Motirám valad Govinda, however, work together a good deal; and in fact, of the pair of plough-oxen that they own and cultivate their holdings with, one is Náru's and one is Motirám's. Motirám's family consists of 2 men, 3 women, and 4 children. Motirám has shares in the same fields as Náru; his shares are the same size as Náru's. He therefore holds 12 acres 11 gunthás assessed at Rs. 21-12; and the 2 families cultivate a holding of 24 acres 22 gunthás assessed at Rs. 43-8. To calculate the cost to Náru of cultivating his holding, it will be best to charge against it only his own family's keep and the keep of his one plough-bullock; for any assistance in labour that he receives from Motirám's family and bullock, he repays with labour of his own family and bullock.

(1). Two adults and 2 children at $1\frac{1}{2}$ lbs. and 1 lb. per diem respectively for 365 days $(2\times\frac{3}{2}\times365)+(2\times1\times365)=5\times365=1{,}825$ lbs; charge all to jowári, the commonest and cheapest grain food.

(2). As regards fodder, Motirám and Náru state that the fodder produced on their holdings suffices for their pair of plough-oxen; but cotton-seed and oil-cake have to be bought during 6 months of the year; thus—

	Rs.	a.	p.
Cotton-seed.			
3 *sers* a day for 180 days=540 *sers* at Rs. $3\frac{1}{2}$ a *palla* =	15	12	0
Oil-cake.			
3 *sers* a day for 180 days=540 *sers* at Rs. 3 a *palla* =	13	8	0
Total ...	29	4	0

Náru's share of this is $\frac{1}{2}$, or Rs. 14-10.

(3). Share of crop to pay labourers remunerated in food-wages in whole or in part.

All hired labour previous to harvest will be paid in cash.

At harvest, reapers in wheat, linseed and ground-nut will also be paid in cash; those in jowári, tur and bájri will be paid in kind. The rate is said to be a *chautha bhar* (4 *sers*), but this is a mere guess, as the payment is actually made with grain in the ear. Taking it as approximately accurate the cost per acre of jowári, tur and bájri would probably be 56 lbs. per acre. The averages are :—

	Jowári.	Tur.	Bájri.
	A. g.	A. g.	A. g.
Survey No. 361	2 8	...	...
„ 424	0 19	0 19	...
„ 454	...	..	0 28
„ 444	...	..	0 7
„ 425	0 $33\frac{1}{3}$	0 $16\frac{2}{3}$	...
Total ...	3 $20\frac{1}{3}$	0 $35\frac{2}{3}$	0 35

The cost therefore will be 196 lbs. jowári, 49 lbs. tur and 49 lbs. bájri.

Threshers will not receive so much, their wages may be taken at 32 lbs. an acre; total 112 lbs. jowári, 28 lbs. tur, 28 lbs. bájri.

Customary dues to balutedárs will be paid in kind in the case of all crops. They may be estimated as follows :—Mhárs 16 *sers*, Talabdás 16 *sers*, Sutár 30 *sers*, Lohár 22 *sers*, Chámbhár 22 *sers*, Hajám 22 *sers*, Kumbhár 8 *sers*, and Dhobi 8 *sers*; total 144 *sers* = 504 lbs.

This may be debited in equal shares to the principal crops—jowári 252 lbs., wheat 252 lbs.

This occupant buys his seed, except the tur, of which he used 3 *sers* (10½ lbs.) kept from last year.

Expenditure in grain, &c., amounts therefore to :—

	Bájri.	Jowári.	Tur.	Wheat.	Fodder.
	Lbs	Lbs.	Lbs.	Lbs.	
Family food	...	1,825	...	...	...
Seed	...	...	10½	...	...
Fodder	...	...	...	...	The whole.
Reaping...	49	196	49	...	...
Threshing	28	112	28	...	...
Village *haks*	...	252	...	252	...
Total ...	77	2,385	87½	252	All.

The value of this will be—

	Rs.	a.	p.
77 lbs. bájri at 44⅘ lbs. per rupee	1	11	6
2,385 „ jowári at 56 „ „	42	9	5
87½ „ tur at 48 „ „	1	13	2
252 „ wheat at „ „ „	5	4	0
453 bundles kadbi at Rs. 3¼ per 100	14	11	7
514 lbs. tur pods, &c., at Re. 1 „ 100	5	2	3
1,885 „ bájri stalks at *anna* 1 „ 100	1	2	10
1,825 „ wheat chaff at Rs. 2-4 „ 1,000	4	1	8
Total ...	76	8	5

(4). Seed—

	Rs.	a.	p.
3½ acres jowári at 12¼ lbs. an acre at 48 lbs. per rupee ...	0	14	4
Wheat 22 gunthás at 68 lbs. an acre / 37 „ at 47 lbs. „ } at 45 lbs. the rupee...	1	12	9
Bájri 35 gunthás at 11 lbs. an acre at 42 lbs. per rupee	0	3	8
Ground-nut 1 acre at 75 lbs. an acre and 40 lbs. per rupee ..	1	14	0
Linseed 3 acres at 12 lbs. an acre and 24 lbs. a rupee ...	1	8	0
Total ...	6	4	9
Fodder (*see* item (2))	14	10	0

(5). Special water-rate and manure purchased. None.

(6). Hired labour. This is a very difficult head to estimate. It is evident that the single pair of bullocks owned by Náru and Motirám will not suffice for the cultivation of their two holdings, amounting to 24½ acres, part of which (3½ acres) is irrigated. For some of the operations on the farm, bullocks must have been hired. But for which, and at what cost, the cultivator himself has no recollection and no means of telling. Thus I am thrown back on calculation of probabilities. The crops (ground-nut, wheat and bájri) in the irrigated area would be occupying the bullocks for watering only up to the time of the rabi harvest; they would then be free for preparing the lands of the whole farm (ploughing and harrowing) for the next crops. And considering that Sávda black soil does not require ploughing more than every other year, it is certainly possible that the one pair of bullocks might get through the ploughing of 12

acres, and the harrowing of 24, in time for the break of the monsoon. It will be safer however to assume that help would be necessary, say, for 8 acres at 8 *as.* and 2 acres a day; that is, Rs. 2 of which Náru's share would be Re. 1. A like amount should be charged for sowing. Bullock-hoeing could be managed by the bullocks on the farm (it would take them a fortnight). For hand-weeding I estimate that 12 women would weed one acre a day. The farmer's women folk assisting, hired labourers at 1¼ annas each would be required for 12¼ acres; this would amount to Rs. 11-8, Náru's share being Rs. 5-12. All these are of course on the average; some fields in the holding being better, some worse, cultivated. For reaping, cash is paid in the case of wheat, ground-nut and linseed, the rate per reaper for linseed and wheat being 4 *as.* a day, or say 12 *as.* an acre; and for bhuimug 1½ annas a day—20 labourers, in addition to the family, would take, say, 4 days to dig an acre. Wheat-reaping would thus cost Rs. 1-2; linseed Rs. 2-4 and ground-nut Rs. 7-8. Threshing will cost less; wheat 12 annas, linseed Rs. 2 and ground-nut nothing. For night-watching Rs. 7-8 may be put down. (This item and sowing are not mentioned in the Resumé of Standing Orders on Crop Experiments, paragraphs 4 and 5). The total is shown below :—

	Rs.	a.	Rs.	a.
Ploughing and harrowing			1	0
Sowing			1	0
Bullock-hoeing			...	
Hand-weeding			5	12
Reaping—				
Wheat	1	2		
Linseed	2	4		
Ground-nut	7	8		
			10	14
Threshing—				
Wheat	0	12		
Linseed	2	0		
			2	12
Night-watching			7	8
Total ...			28	14

(7). Purchase and replacement of stock. A sum of Rs. 8 may be entered here.

(8). We can now add up the cost of cultivation :—

	Rs.	a.	p.
(i) Value of charges paid in kind	76	8	5
(ii) Seed and fodder	20	14	9
(iii) Hired labour	28	14	0
(iv) Purchase of stock	8	0	0
Total ...	134	5	2

The holding being 12 acres 11 gunthás, the cost per acre is Rs. 10-15-1.

(C).—Net Return.

	Jowári.	Tur.	Bájri.	Wheat.	Ground-nut.	Linseed.	Fodder.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
(1). Gross Return ...	2,444	412	459	1,437	2,250	1,080	See 14 (A).
Charges paid in kind...	2,385	87½	77	252	...	...	All.
Net ...	59	324½	382	1,185	2,250	1,080	...

				Rs.	a.	p.
(2) Values—						
Jowári	59	lbs. at 56 lbs. a Rupee	...	1	0	10
Tur	324½	„ 48 „	...	6	12	2
Bájri	382	„ 44⅘ „	...	8	8	5
Wheat	1,185	„ 48 „	...	24	11	0
Ground-nut	2,250	„ 53⅓ „	...	42	3	0
Linseed	1,080	„ 20½ „	...	52	10	11
				135	14	4
		Charges paid in cash	...	57	12	9
(3). Net return after paying cost of cultivation			...	78	1	7
(4). Out of this have to be defrayed—						
(i) Assessment			...	21	12	0
(ii) Local Funds			...	1	5	9
				23	1	9

For clothes, a man, his wife and 2 sons can hardly do with less than :-

		Rs.	a.
Man	1 Turban to last 4 years, costing Rs. 4 ...	1	0
	2 *Angarkhás* at annas 12 to last 2 years ...	0	6
	2 *Dhotars* at Rs. 2-4 the pair to last 3 years.	0	12
	1 Pair of shoes at Rs. 1-4	1	4
		3	6
Wife	½ *Lugde* at Rs. 5	2	8
	1 *Choli* at annas 10	0	10
		3	2
	The boys will wear nothing for some years and then odds and ends only, say, Re. 1 each a year.	2	0
	Total ...	8	8

I am not prepared with any detailed estimate on the subject of 'oil, condiments and the like necessaries.' But as táluka sepoys live and bring up their families on Rs. 6-8 a month, and as our cultivator has been already allowed the grain and clothing sufficient to keep the family alive and decent, the sum that should be set down under this head is small, say Re. 1 a month or Rs. 12 a year.

Thus we have :—

	Rs.	a.	p.	Rs.	a.	p.
Net return after deducting cost of cultivation only ...				78	1	7
Clothes	8	8	0			
Oil, pulse, condiments and all necessaries ...	12	0	0			
				20	8	0
Net return after deducting all expenses				57	9	7
Except assessment and Local Fund cess				23	1	9
Net return				34	7	10

This balance is available for expenditure on ceremonies, luxuries, extra comforts and debt. It is not beyond the mark ; for Náru told me that he was paying off his debt by yearly instalments of Rs. 30.

(D).—*Percentage of Assessment.*

The percentage of the assessment (Rs. 21-12) on the net return after paying cost of cultivation (Rs. 78), is 28. If the percentage be taken on the net return after deducting all expenses including Local Fund Cess (Rs. 56¼), it will be 38.

15. That finishes the patchwork coat. Whatever their accuracy, I am pretty sure my calculations have not exaggerated the net result of the year's farming. The coat has had several chances in favour of its turning out a tolerably pretty and well-fitting one. (1) There has been no cotton on the holding; and in patchwork, cotton is a most unmanageable article; (2) in all but 2 cases (bhuimug and dry wheat) I have had my own measurements to manipulate; while (3) in all but those 2 cases and 1 other (tur) I have had measurements in the same táluka in two instances (wet wheat and linseed) in the same village from which to work out my lettings out and takings in.

16. I have only to add a remark or two on the holder's condition.

He owns a cow, buffalo and a heifer. No doubt he makes something out of the former. He has borrowed Rs. 140—Rs. 50 for a marriage, Rs. 60 for current expenses, and Rs. 30 towards buying his bullock. He pays back (as already noted) by instalments of Rs. 30 a year; having paid one only he owes Rs. 110.

17. The experiment shows that in Sávda a holding of 12¼ acres (10½ dry-crop and 1¾ irrigated) will support in comfort a family of a man, his wife and 2 children.

R. A. LAMB,
Assistant Collector, Khándesh.

Sávda, 14th April 1885.

APPENDIX D.

Special Experiment by Mr. J. Fairlie Muir, referred to on page 17.

The crop was cut in my presence and forthwith carried. I let none of it out of my sight till it was deposited on four different cloths in front of my tents. There it remained for five days in the custody of my Police guard—a sentry on it night and day. It was, then, dry enough to be thrashed. It was trodden out, weighed and measured in my presence. I am confident that the crop was not tampered with in any way.

2. This Survey Number (235) constitutes the holding of a Lingáit—"a pure cultivator, who devotes himself with his family *entirely* to its cultivation and subsists on the profits thereof." The family consists of two brothers and their two wives—all able-bodied cultivators. They have three children—too young to help in any way. The children, then, are not taken into consideration in estimating the cost of cultivation. The land is cultivated with a pair of buffaloes and a pair of bullocks.

3. The time of the family is taken up in field-work, preparing the produce for market and selling it. They do *no other work of any kind.* The bulk of the produce is rice. The cultivators, themselves, convert this into cleaned rice (akki). It is sold *as such.* Such is the usual practice in this part of the táluka. The cost of hired labour to clean it would be "one billi per chitti" (*i. e.* 3 pies for 4 *sers*) of rice in husk; this cost the cultivators save by husking it themselves.

4. The process of husking is simple and effective. The out-turn of the different kinds of rice and of the various kinds of culture varies *very considerably.* This is Somsáli rice—raised by the Kurgi bhatta culture and poorly manured. I set myself to find out the component parts of the bhatta (the rice in husk). I enquired of the six leading rice-dealers in the Kalghatgi bazár; and recorded their estimates in writing. I had bhatta husked and prepared in my presence. The Mámlatdár, at my request, made a personal and independent test.

5. The results are much alike. I give, here, those *of a test made by me.* The *10 sers of bhatta were part of the crop cut by me, and a fair sample. The cleaning, measuring and weighing—the whole of these processes—were done in my presence.* The results appearing strange, I made a similar test some time afterwards, so that there might be no mistake. The results of the two tests tallied very closely :—

Measure.	Bhatta yielded.	Weight.	
10 *sers.*	... .	27 lbs. 8 ozs.	
4·34 „	... Akki	... 16 „ 4 „	or 59·09 per cent.
0·85 „	... Nuchu	... 3 „ 3 „	or 11·59 „
1·25 „	... Tavadu	... 2 „ 6½ „	or 8·75 „
9·05 „	... Kobbattu	... 5 „ 10½ „	or 20·57 „
			100·00

6. The bhatta is rice in husk, of the kind noted above. The cultivator in this part of the táluka does not eat the akki (clean rice); he, as a rule, sells the whole of it. He takes care to dispose of it to the best advantage. He sells it in small quantities from time to time. He carefully follows the bazár prices. He would realise a much better price than what I have allowed him,—*i. e.* than that obtaining at the time of the first instalment.

7. He eats the nuchu (broken rice), supplemented by jola (great millet, Sorghum vulgare). He sells the tavadu (bran)—food for milch-cattle. The Kobbattu (husk) is thrown away—as valueless.[1]

[1] Some little way to the east, however, it fetches a price as fuel for furnaces.

8. The costs of cultivation are as follows :—

I.—*In Kind.*

		Money value. Rs. a. p.
(1)	*Wages.*—5 men for 5 days to spread manure, sow, &c. 25 men for 2 days to reap, 10 men for 4 days to thrash the grain and carry it home. The wage is 4 *sers* of bhatta a day per man ; that is 460 *sers*... ...	25 8 11
(2)	*Seed* at 28 *sers* per acre = 180 *sers* bhatta	10 0 0
(3)	*Customary Dues* per yoke of cattle :—Blacksmith, 20 *sers* bhatta ; Carpenter, 20 ; Holers, 120 ; that is, 320 *sers* for the 2 pair	17 12 5
	The other customary dues—*i. e.*, payments to the village-barber, village-priest, washerman, &c.—do not form part of the costs of cultivation	.....
(4)	*Fodder*, 276 *pendis* of rice-straw	25 14 0
(5)	*Food*—Nuchu, 338½ *sers*, eaten by the cultivators—(16 *sers* the rupee)	21 2 6
(6)	*Manure*—10 cart-loads (home manure)	3 0 0
(7)	Only in one matter did the occupant receive help from other cultivators. This was to repair the embankments of the rice-terraces at the Punarvasu and Pushya Nakshatrás (July—August). He repaid this assistance by doing similar work in the fields of these other cultivators. The work does not increase the present estimate of cultivation-cost, seeing that in the estimate the occupant's *whole* time and labour are accounted for.	.....
	Total ...	103 5 10

9. II.—*Cash Outlay.*

	Rs. a. p.
Cattle, fed on grass for 7 months, in the neighbouring jungle (at 2 annas a head), on the sides of the field and elsewhere.	0 8 0
For the remaining 5 months on rice-straw ; ½ a *pendi* an animal per day, that is 300 *pendis*. Of this 24 *pendis* have to be bought	2 4 0
For 50 days, at ploughing time, hottu is given. This is the chaff of jola, togari, hesaru, hurli, &c. At 5 lbs. a day per animal (1 lb. for 3 pies) this comes to 1,000 lbs. ...	15 10 0
10 additional cart-loads of manure	3 0 0
Cart-hire for carting 20 loads of manure to the field ...	1 0 0
3 weedings ; in all 15 men for ten days at 2 annas a man per day	18 12 0
Cart to help in carrying crop home	0 8 0
Price of a yoke of bullocks (Rs. 36) and a yoke of buffaloes (Rs. 44)—these work for 10 years...	8 0 0
Local Funds = one anna per rupee of assessment ...	2 7 0
Construction of a dwelling-house for the cultivators and their cattle, Rs. 125. The house lasts for 100 years. Rs. 3 annual repairs. The money, borrowed at 10 per cent. interest per annum, is repayable in 100 years in equal yearly instalments	10 8 0
Clothing—Rs. 9 per adult per annum	36 0 0
Grain ; at 1½ lb. a day per adult for one year. This comes to 2,190 lbs. for 4 cultivators. Deduct the 1,269⅓ lbs. nuchu. The remaining 920⅔ lbs. are of jola, purchased weekly at the bazár. The *average* price of jola in 1884 in the Kalghatgi bazár was 17½ *sers* the rupee	14 4 6
Oil for eating and burning	10 0 0
Salt and condiments	15 0 0
Milk, *ghi*, &c.	10 0 0
Fuel costs nothing. It consists of cow-dung and of sticks, gathered in the neighbouring jungle	.....
Earthen and metal pots for water and cooking	3 0 0
Shoes and leathern fastenings for bullocks ; supplied by the Holers, who receive customary dues	.....
Rope for tying up crops, yoking oxen, &c.	1 0 0
Wooden grinding-mill, baskets, fans for winnowing, &c., &c....	3 0 0
Iron purchased for the plough-share, sickles, hoes, &c., made by the blacksmith. These last from one to four years ...	4 0 0

	Rs.	a.	p.
Wood, purchased for the plough, drill, roller, &c., made by the carpenter. These require, most of them, to be renewed yearly; others last for 6 or 8 years	2	0	0
Total ...	160	13	6

10. It is commonly estimated in this táluka that a pair of bullocks and a pair of buffaloes can plough, &c., 8 acres of good rice land. If the land is twice-cropped, the amount of land thus culturable is less. A deduction of one quarter of an acre is made for each acre twice-cropped. If, as in the present case, 4½ acres are twice cropped, the amount of land thus cultivable should be 6 acres 35 gunthás.

The holding in question is less than this. Its area is 7 acres 1 guntha. Of this, however, 24 gunthás are dry-crop (khushki) land, 23 gunthás of which are unculturable and one guntha is planted with chillies. The rice (tari) land measures 6 acres 17 gunthás, with 4½ acres twice-cropped,—18 gunthás (no allowance being made for the *khushki* land), this is, less than the proper amount of land, as usually estimated.

11. This holding, suitable in other respects, has one great defect. It yields a crop—*i. e.*, the 2nd crop—on a, by no means, "insignificant area," which crop I have not been able to "estimate directly or indirectly."

The cultivator considers that only 4½ acres of the land repay being twice-cropped. For many years he has raised a second crop on about this amount of land. He recrops the same land year after year. This contains the better soil; low lying, it retains moisture for a longer time.

12. It is indisputable that the land is thus twice cropped. Yet, singularly enough, no mention is made of the second crop in Village Form No. III. The Kulkarni explains that he did not know that the second crop ought to be entered in his returns. Nor is he singular in this; most of the Kulkarnis in this táluka have done the same. I can offer no reliable estimate of the amount of twice cropped rice land in the táluka, or of the number of villages in which it is met with. From Táluka Forms Nos. 28 and 34 for the year 1883-84 I gather the following:—There are 112 Government villages and 19 Inám villages in the táluka. In 105 of the former there are, exclusive of the *inám* land in these villages, 22,787 acres of occupied rice land; while the amount of twice-cropped rice land is entered as only 303 acres and that in only 7 villages! This is manifestly incorrect. A *considerable* part of the rice land is *undoubtedly* twice-cropped; twice-cropped rice land is met with, too, in almost every rice village. Further, the great majority of the Kulkarnis, whom I have questioned, admit that they do not enter the second crop; they plead ignorance.

13. The above matter is pertinent in this wise. It proves that its omission from Village Form No. III. does not show that a second crop has not been raised, year after year, on the land in question. It was so raised this year.

14. Of this 2nd crop I have ascertained the following particulars. There is no regular rotation of crops; various kinds of pulses are grown at pleasure. The crop is not irrigated. No fresh manure is applied. Gram (Cicer arietinum—kadle) was, this year, sown in 2 acres; mug (phaseolus mungo—hesaru) in 2 acres; and udid (phaseolus radiatus—uddu) in half an acre. That, too, is how the land is generally laid out. With each of these crops linseed (linum usitatissimum—agashe) is grown; three or four rows of it are sown among every seven rows of one or other of the other crops.

15. The outturn of this second crop is so much net profit, the seed, of course, being deducted. The *whole* of the work of cultivating it is done by the occupants themselves and their cattle. No extra manure is applied. The cost of cultivation, then, as estimated by me, is that of cultivating 6 acres 17 gunthás of good rice land and one guntha of land under chillies (the seed alone excepted). In it is included the cost of the cultivation of the land (4½ acres) twice-cropped (the seed alone excepted) with gram, mug, udid and linseed.

16. In this Survey No. (holding) are 24 gunthás of dry-crop land, assessed at 12 annas, the rate being Rs. 1-4-0 an acre. Of this, 23 gunthás are, in my opinion, unarable, and ought, therefore, not to be assessed. This bears coarse grass; it cannot, as far as I see, bear anything else. It is too steep to be ploughed. Trees growing on it would injure the rice. Nor is it permissible to cultivate it in any way—even were that possible. This is so, because it forms part of the embankment of the tank. Its cultivation would, in time, seriously endanger the safety of the embankment. It seems to me probable, then, that these 23 gunthás have been assessed through some mistake.

17. The remaining one guntha of the dry-crop land is level. It lies at the foot of the embankment, out of reach of the water. It received a little manure. Chillies were grown on it this year. The yearly rotation is vegetables of sorts. The cost of cultivation is included in that of the tari-land, except that no count is taken of the chilli-seed.

18. The "local *ser*" measure, used by me, is the one commonly used by one of the leading rice-dealers of Kalghatgi. It is known as "the Dhárwár *ser* by heaped measure," and bears the Collector's stamp. It is of the kind generally used in the Kalghatgi bazár. The capacity of these *sers* varies considerably (*see* Collector's letter No. 4280, dated 14th November 1882). By actual test I found the contents of *this* ser to weigh—

		Lbs.	oz.
Somsáli—(*see* para. 5)	Bhatta...	2	12
	Akki	3	12
	Nuchu		
	Tavadu	1	14¾
	Kobbattu	0	10
Jola—(average weight of several samples)		3	11

19. Of the gross produce, 3,983¼ *sers*, (the result would have been much more favourable had the land been properly manured), of bhatta remain, after allowing for payments in kind, feed of cattle, &c. These become 1,728¾ *sers* of akki, 338½ of nuchu, and 498 of tavadu. The nuchu has been eaten. The akki (at 8 *sers* the rupee) fetches Rs. 216-2-0 and the tavadu (at 70 *sers* the rupee) Rs. 7-2-0.

20. On the produce of this holding a family of two brothers and their wives live in comfort. The costs of cultivation (Rs. 41-1-11 per acre of the rice-land) are Rs. 264-3-4. Of this, Rs. 160-13-6 is cash outlay; the remainder is the value of the payments made in kind, &c. The net profits are (1) Rs. 62-6-6 (from this the Government assessment, Rs. 39, has to be deducted); (2) the produce (after the seed is allowed for) of one guntha of chillies, and (3) the produce (after the seed is allowed for) of the after-crop on 4½ gunthás; this after-crop being gram, linseed, mug and udid.

21. Taking the cash outly on the cultivation *of the whole* (the costs of cultivation cannot be otherwise calculated than on the whole holding) *of the holding —i. e.*, of the 6 acres 17 gunthás of rice, of the one guntha of chillies (seed not allowed for) and of the 4½ acres recropped (seed not allowed for); it falls *on the 6 acres 17 gunthás of rice* at Rs. 25-0-7 per acre.

The *whole* (after the seed is allowed for) *of the produce of the chillies and of the second crop is net profit.* Leaving this out of consideration, we have Rs. 9-11-5 an acre net profit on the rice *alone*. Rs. 5-15-0 an acre, to be deducted therefrom, is the Government land-assessment.

22. It cannot be gathered from this what the exact proportion is, that the Government assessment bears to the true rent—*i. e.*, the net produce or profit. It clearly appears, however, that it is low. It is considerably less than "50 to 80 per cent. of the true rent." This is considered (*see* Survey and Settlement Manual, 1882, para. 17, of page VI. of the Appendix, given at page 124) a "liberal assessment" by the highest authorities.

23. I have to add to this already lengthy report that the information recorded therein was obtained by me—almost the whole of it—by personal enquiry. The cultivators are shrewd men; and, I believe, reliable. They, the village

officers, and other villagers answered my questions frankly and fully. On all important points, whenever there was doubt, I made a formal reference to a Panch of the villagers of Kalghatgi, where the land lies; and in each such case also to a Panch of Hulginkatti, where the occupant lives. The Mámlatdár and especially two Circle Inspectors gave me much assistance. From my own knowledge and what I gathered as above, I have made these estimates. I feel confident that they are approximately correct.

J. FAIRLIE MUIR,

First Assistant Collector, Dhárwár District.

Forwarded to the Director of Agriculture.

2. The experiment has been most carefully made and is consequently very valuable. Para. 12 shows that land cropped twice has been generally omitted from the crop statistics. The Circle Inspectors will take care to guard against this gross mistake in future.

J. R. MIDDLETON,

Acting Collector.

NOTE.

Enquiry made with reference to Mr. Muir's remarks in paragraph 16 above shows that the 24 gunthás classed as dry-crop form part of the outer slope supporting the masonry dam of a tank from which the occupant waters his rice land. The tank is actually situated in another village. The masonry dam is the boundary. At the revision survey it was found that the occupant of the field experimented on had a usufructuary right over this slope. Otherwise it would have been made into a separate number. It could not have been included in the tank number, because that is situated in another village. It is to the owner's interest that cultivation which would endanger the safety of the tank should not be allowed. Moreover it is chiefly steep slope which would not repay cultivation. If it had been thought that cultivation calculated to endanger the tank would be likely, the slope would have been purchased or taken up under the land Acquisition Act. But such a course was not necessary, nor was there any necessity to record express prohibition against cultivation. The occupant has actually converted 3 gunthás of the 24 gunthás into rice land and on three gunthás more he grows chillies and other crops. The remaining 18 gunthás he keeps under grass. The right to cut the grass on this portion would sell for Rs. 2 per annum. But the owner would not part with it. He is well satisfied with the decision of the Survey which in fact is in every respect just and reasonable. Mr. Muir's suggestion that the assessment of this strip was made under some mistake is incorrect.

E. C. OZANNE,

Director of Agriculture.

APPENDIX E.

Notes of tests taken by Mr. W. S. Price, referred to on page 19.

Tobacco.

Counted in a plot of ground 3 chains × 3 chains (measurer's 16 anna chains, 33 feet in length) *i.e.*, 9 gunthás area, number of plants 26×26=676 plants. This gives 3,004$\frac{1}{3}$ plants in one acre. Had four packets (of the kind made up by the rayats of the north part of the Chikodi Táluka) made up in my presence of the leaves of these plants. These 4 packets took the leaves of 136 plants, and the 4 packets weighed 64 lbs. immediately they were made, *i.e.*, in the moist state of the leaves after they are taken out of the curing pit. The above gives 88$\frac{3}{4}$ packets to the acre.

These packets take about from one to two months drying and curing before they are bought from the rayats. Of the four packets made up in my presence I kept one from the 6th February to the 19th April, *i.e.*, 73 days. It was then pronounced to be in good condition for sale. The weight of this packet came to 9 lbs. on the 19th April, the day I returned it to the owner (a rayat of Yeksambai, Chikodi Táluka). This gives of dried tobacco, as ready for the market as the rayats make it, lbs. 799$\frac{1}{4}$ to the acre.

I estimated the crop in which this experiment was made to be a 12-anna one.

Note.—The formulæ show the yield for a 16-anna crop as 3,000 lbs. Mr. Price in another report suggested that the formulæ should be corrected thus:—16-anna crop, 1,000 lbs. 12-anna crop, 800 lbs.

Turmeric.

Had one guntha of this dug up in my presence at Sámánvádi of Sadalgi, Chikodi Táluka.

This immediately after it was dug up, was cleaned of adhering earth and fibrous roots and also of the old seed bulbs and then weighed. It came to lbs. 499. This gives 19,960 lbs. to the acre of freshly dug up turmeric. (The bulbs put aside for fresh seed weighed 187 lbs.; this should be added in; makes 686 lbs. in one guntha and 27,440 lbs. in one acre).

Of this turmeric I took 21 lbs., had it boiled, and then dried in the sun in the way done by the rayats in preparing it for the market. After drying for three weeks it was said to be fit for sale; it then weighed 5 lbs. 13 oz. According to this one acre of land produces (including the bulbs for fresh seed it comes to 7,595 lbs.) 5,524 lbs. 10 oz. of prepared turmeric ready for the market. As I was not satisfied with the boiling part of the experiment, two pots being used one turned out very different to the other, I intend repeating it when I get another chance. However the weight of the unprepared turmeric is correct without any doubt. I have been told by rayats that prepared turmeric is about one-fourth the weight of the unprepared.

This turmeric crop was said to be a fair one, say a 12-anna one.

Sugarcane Juice.

(For sugar-making.)

At Sámánvádi of Sadalgi sugarcane juice was being sold to makers of soft country sugar at the rate of Rs. 5 for 22 pots (the pot is a standard measure in these villages about, for selling the juice to sugar-makers; it is said to hold a certain number of old Sátára *sers* of grain), each pot of 10 *lotás* (in another village I was told that the juice was selling at from Rs. 5$\frac{1}{4}$ to 5$\frac{1}{2}$ for the 22 pots). After getting the above information I had one guntha of a fair crop of sugarcane cut down and the juice pressed out and measured (all in my presence). The quantity of juice came to 482 of the above *lotás*.

At the price of Rs. 5 for 220 *lotás* the above gives Rs. 10-15-3 worth of juice from one guntha, and Rs. 438-2 from one acre.

Ten *lotás* of this juice measured 27 pints, Imperial, so the one guntha gave 1,301$\frac{2}{5}$ pints. This comes to 52,056 pints to the acre (6,507 gallons).

I weighed 1 pint of the juice—the pint measure I have,—the weight came to 1 lb. 5 oz. According to this the weight of juice in one guntha is 1,708$\frac{7}{80}$ lbs. and in one acre is 68,323$\frac{1}{2}$ lbs.

I considered the crop I experimented in to be a 12-anna one.

I could not go on further with this experiment, so cannot say what quantity of sugar can be made from the juice of one guntha. But I visited the place two or three times to see the different steps followed by the people here in making sugar. My notes on the subject are as follows :—

Sugar-making.

(In the Chikodi Táluka, Belgaum Collectorate.)

The sugarcane juice is pressed out and poured into a large circular boiling pan about 5 feet in diameter and 2 feet deep. It is then allowed to come to the boiling point several times; stirring of the juice and skimming off of the impurities as they rise to the surface go on at short intervals. During the boiling of the juice, about a quart of water, in which the bruised roots of *Bhendi* plant (Hibiscus esculentus) have been macerated for about an hour, is poured into it. This liquid is of the consistency of the white of eggs, and acts in the same way as that substance does in clarifying sugar, effectually bringing to the surface all impurities in the boiling juice. After the skimming away of the impurities, the juice becomes of a clear light brown colour. When the juice has thickened to a thin syrup it is poured into a deep wide-mouthed earthen pot, called a *ránjan*. Here it is allowed to cool, being stirred vigorously at intervals to ensure the cooling taking place uniformly throughout the syrup. And when it has cooled down to the consistency of a thick paste, it is put into small *ghágars* or narrow-mouthed earthen pots.

This ends one distinct stage of the manufacture, and generally an interval of several days elapses before further operations commence.

The next step is to provide large baskets of coarse bamboo matting, which are about 5 feet square and 3 feet high. These are placed in a room, the floor of which is divided by small ridges about six inches high by six inches wide, into as many compartments as the number of baskets requires. From these compartments small narrow and shallow channels are made leading to a small pit containing a *ránjan*, in the floor of the room. The baskets being placed in the compartments, they are filled to within six inches of the top with the pasty sugar from the pots. This is not done direct from the pots in which the sugar may have been lying for several days, but the sugar is emptied out of the pots into a large pan, similar to the boiling pan mentioned above, and then taken from this pan by means of a large copper pot, like the ordinary Indian cooking pots, and emptied into the baskets. This pot is rinsed with a strong solution of salt every time it is filled with the sugar to be taken to the baskets. From the mass of sugar in the baskets the treacle contained in it drains out through the basket work interstices into the floor compartments and flows along the channels into the pit.

To aid in the process of the surface sugar being cleared of treacle, a thick layer of green *shevál*, a weed or moss that grows in some wells and streams, is spread on the top of it. A fresh thin layer of it is added after each removal by scraping off of the surface sugar. This scraping off of the surface sugar takes place daily to a depth of about an inch, till all the sugar is emptied out of the baskets. The scraped off sugar is now of a darkish grey colour, and saleable in the local markets, but as it still contains a little treacle, shown by its being moist and apt to cake, it is said not to keep well. To obviate this, it undergoes a process of drying by treading and bleaching in the sun. This is done by the sugar being spread out on coarse cotton sheets, on ground prepared hard and smooth, and exposed to the sun. The sugar is spread out in a layer

about 6 inches deep and then trodden on by men walking three or four times up and down over it in short steps with a twisting or grinding motion of the feet. The trituration by treading that the sugar thus gets, breaks up the lumps in it and helps to thoroughly expose every particle of it to the sun; this dries and bleaches the sugar to a light grey colour. After this last process of treading, drying and bleaching, the sugar is not liable to cake, and is considered perfect, as it will keep any length of time.

The treacle that drains out of the sugar is stored away till it gets sale to country liquor makers.

Every detail given in the above description of sugar-making was seen in actual practice by me, and I believe no essential particular escaped my notice. The method from commencement to end is simple in the extreme; the appliances used rough, ready and therefore cheap, but the result is not satisfactory, in as-much as the production has in it worse impurities than had been got rid of by skimming at the syrup stage of the process, gathered during the subsequent stages, from filthy surroundings and unclean manipulation. The question is, can we teach the men who follow this industry a better method, giving better results, bnt at the same time not far removed in simplicity and cheapness to the one they are acquainted with?

The rayat in whose place I saw the sugar being made is well-to-do, and in energy and enterprize is far ahead of his compeers. His name is Bába bin Bápu Khot of Sámánvádi of Sadalgi of the Chikodi Táluka. I believe he will be found to be ready to adopt any improvements that may be shown him. So if there is as simple a way, or nearly so, of making sugar, as the one I have described, but cleaner[1] and giving better results, this man will give it a trial. Also if there is a better kind of sugarcane mill than the one used in these parts, he is the man to give it a trial. The experiment is worth trying, as that part of the country is under sugarcane cultivation every year to a very large area.

W. S. PRICE,

Assistant Settlement Officer, Revenue Survey.

[1] The only stage at which the article is fairly free of filth is when it is poured from the boiling pan into the *ránjan* to cool. After that not much care is taken to keep dust getting into it and whatever filth now gets into it remains there. *Moral.*—"Avoid eating or using in food or drink soft country sugar not clarified."

APPENDIX F.

EXPERIMENTS BY *MR. J. J. Heaton, referred to on page 13.*

Ordinary Experiment No. 1—Rice.

1. Experimented only on 1 acre 28 gunthás out of the whole 4 acres 15 gunthás as the remainder was cultivated by different persons.

2. This 1 acre 28 gunthás was divided into 3 plots:—

Plot.	Area.	Area cut.	Out-turn.	
			Rice in husk.	Straw.
	Gunthás.	Gunthás.	Lbs.	Lbs.
1st	26	2	75	107
2nd	11	1	37	54
3rd	31	3	141	235
Total ...	68	6	253	396

Plots 1 and 2 are thus seen to be exactly the same in quality. Plot three is superior. Plots 1 and 2 I call 11-anna crops. Plot 3 a 14-anna crop. It is to be noted that as the quality of the crop is better, the yield of straw is proportionately much greater than the yield of grain—a decided characteristic of this season.

In order to deduce yield per acre the total yield must first be arrived at, thus:—

Grain.		Straw.	
$75 \times 13 = 975$	lbs.	$107 \times 13 = 1{,}391$	lbs.
$37 \times 11 = 407$	,,	$54 \times 11 = 594$	,,
$141 \times 10\frac{1}{3} = 1{,}457$	,,	$235 \times 10\frac{1}{3} = 2{,}428$	,,
Total ... 2,839	,,	Total ... 4,413	,,

This is the yield of 68 gunthás or 1 acre 28 gunthás. Therefore the yield per acre is grain 1,670 lbs. and straw 2,596. lbs.

The 3rd plot had received the accumulated rain-water sooner than the other two, and hence the superiority of its crop.

3. This crop was a very fair sample of the rice crops in similar land in and about Belgaum, but better than those of other parts of the táluka.

4. The above shows how the acre figures are deduced. They are not deduced by simple multiplication from the area actually experimented on. I regard the method here adopted as the safest. For it is based on a determination by actual measurement of the areas under crops of different values. I adopted the same method in my jowári experiment. Undoubtedly it complicates figures, but that is the fault of the land experimented on. It is, I think, not safe to assume that any considerable area is covered with an even crop; that being so, it is necessary to determine the areas under each quality of crop and calculate the whole yield before calculating the yield per acre.

5. Method of cultivation and materials for calculating its cost:—

I now consider only the cultivation of the rice and omit all consideration of the second crop. As soon as the second crop is pulled, that is, the end of February or beginning of March,—

(1.) A 2-bullock-*kulav* (harrow) is used to loosen the earth; 4 acres can be done in one day.

(2.) The *bándhs* are repaired and water-channels made. If the *bándhs* need earth it is taken from the field. If they have too much, the surplus is spread over the field. Four coolies can do an acre in a day. They receive 3 annas a day.

(3.) The two-bullock *kulav* is then used. It goes over the ground three times. Commonly two *kulavs* work at once: 1 *kulav* does 2 acres a day. This is done to break up the ground and loosen the weeds, grass, &c.

(4.) The *Kolpa* or bullock-hoe is now used. It is a wooden beam 4 to 4½ feet long with iron teeth fixed in it 4 or 5 inches long, each tooth having this shape. This thoroughly loosens and breaks up the soil. Four bullocks are used and 2 men. One acre is done in a day. It is done three times.

(5.) The *hendura* is then used to break the clods and level the field. It is a plank drawn by two bullocks, the driver standing on it. It is about 8 feet long and does four acres a day.

(6.) The *bándhs* are again repaired.

(7.) The manure is then spread by hand. Four large or 7 or 8 small carts used per acre. In this case 6 large carts were used at 8 annas each. Each cart requires 3 men and can ply between field and town 3 times a day.

(8.) The manure is spread either with a *kulav* or a small *hendura*; 2 acres a day done.

(9.) Just before sowing the *aut* is used. This is a beam about 6 inches square in section, 8 or 9 feet long, furnished with wooden pegs 7 or 8 inches apart. It is drawn by two oxen and goes over the ground 3 or 4 times. It does an acre in ½ day, going over the ground the required number of times. Its use is to mix the manure well into the soil and break up the soil itself.

(10.) If necessary coolies are now employed to pick out loose bits of grass, weeds, &c.; 1 man per acre enough at 2 annas.

(11.) *Sowing*—Done with a 6-coulter drill drawn by 2 oxen, requires 2 men, does two acres a day followed by the *balsal*, a small *kulav*, drawn by two oxen. The *balsal* is followed by the *phesati*. The *phesati* is a light wooden frame-work about 8 feet square filled in with thorny branches to scratch and level the soil.

Sixty rows of seed go to a measurer's chain of 11 yards. Estimate of seed required varies. Owner of field I experimented on said 80 lbs. an acre. Another very intelligent cultivator who keeps accounts told me he only used 60 lbs. per acre.

(12.) The seed appears above ground about a week after sowing. From the time it is an inch or two high to the time it is 6 inches high, the *kolpa* or *aut* is used to clean the field of weeds, &c. One acre can be thoroughly done in 3 days.

(13.) *Hand-weeding*—Done first a week after the *kolpa* or *aut*, again at the end of July and at the end of August. Each weeding takes 8 men per acre for 1 day; wages 2 annas a day.

(14.) In August the bad plants are picked out; 4 men do one acre in 1 day; wages 2 annas a day.

(15.) *Cutting and stacking the rice*—11 men per acre at 4 *pendis* of rice each; 4 *pendis* are worth about 5 annas.

(16.) *Making threshing-floor*—4 men 1 day at 3 annas each.

(17.) *Threshing and winnowing.*—It is reckoned that to thresh 1 *khandi*=2,400 *sers* of rice, costs Rs. 2-8-0, if all done by hired labour. It would take 6 bullocks and 4 men about a night and a day

(18.) *Carting the produce home.*—A very difficult item to calculate exactly; the cart drawn by six oxen can carry a *khandi* of rice and each cart-load of grain means at least two cart-loads of crop.

(19.) *Watching*, &c.—A man at Rs. 4 a month can watch and look after the arrangements for keeping the water in a field of about four acres.

(20.) *Customary dues*—4 per cent. of the rice in husk.

6. Actual cash and kind payments were:—

(1). Weeding—5 rupees.

(2). Reaping—80 *sers* of rice.

(3). Threshing—48 *sers* of rice.

(4). Sowing—1 coolie for one day at 3 annas.

(5). Watching, &c.—A man employed at Rs. 4 per month for 5 months. He also helps in the other operations.

(6). Customary dues.

7. The prices on which calculations made were :—

At time of experiment—Rice in husk 28 *sers* = 42 lbs. per rupee.
Rice straw 5 annas for 100 lbs.
At time of instalment—Rice 26 *sers* or 39 lbs. per rupee.
Rice straw 6 annas per 100 lbs.

8. The sum entered in column 8 (Tabular Summaries) includes nothing on account of the second crop of peas or other produce. Rupees 10 per acre is a fair allowance on this account for this season (*see* Experiments on Rice and Peas, Nos. 3 and 4 in the Tabular Summaries ; also No. 3 below).

J. J. HEATON,
Assistant Collector.

Ordinary Experiment No. 2, Jowári and Kulthi.

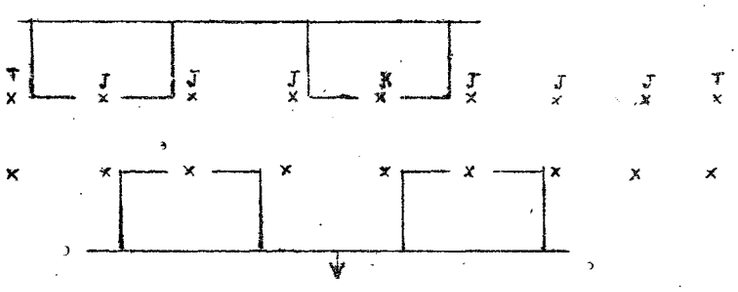
1. The field area, 15 acres 14 gunthás, I found from actual measurement to be cultivated as follows:—

	A.	g.
Bájri, Navani, &c., not experimented on	3	34
Jowári, Kulthi, and Tur mixed with a little Ambádi	10	20
Waste	1	0
	15	14

The Kulkarni's estimate was :—

	A.	g.
Jowári (Great millet)	9	0
Tur (Cajan pea)	2	0
Kulthi (Horse gram)	2	0
Navani (Italian millet)	1	20
Bájri (Spiked millet)	0	20
Others	0	14
	15	14

2. The part experimented on was sown thus :—three rows jowári only 1 row jowári and kulthi, three rows jowári only, 1 row jowári and tur, and so on again throughout. The sowing was done with a four-coulter seed drill, a moghan or single seed-tube following for the pulse every fourth row. Forty rows cover exactly 11 yards in breadth and a set of 8 rows, therefore, $2\frac{1}{5}$ yards. The common practice in Chikodi is to sow jowári with a pulse either every fourth or every eighth row—in the latter case tur only, in the former kulthi or matki alternately with tur. I have seen tur sown every fifth row, but this is not common. The perfect regularity of the sowing of mixed crops leads one to suppose that rules might be framed for determining the area under each in a more satisfactory way than is now done. The reason the rayats give for sowing the pulse every fourth row is that when the bullock-hoe is used about a month after sowing, the pulse makes a sharply defined line by which to guide the bullocks. The bullock-hoe is double and its use will, I hope, be clear from the following rough diagram.



The crosses show the rows of the crops :—J. jowári alone, T. and K. the rows of jowári mixed with tur and kulthi respectively.

3. The method of calculating the outturn of jowári adopted is similar to that for the rice experiment. I found 10½ acres under jowári, tur and kulthi. The quality of the crops varied very greatly owing chiefly to the great avriations in the quality of the soil, from good black to the very bad stony red soil. 3½ acres were very good black soil and had a fair crop. I should say about 8 annas. I cut two patches of 4 gunthás each:—

Result (Outturn).

Patch.	Grain.	Kadbi.
1	28 *sers.*	116 lbs.
2	24 „	80 „
	52 for 8 gunthás	196 for 8 gunthás
	=260 *sers* per acre.	=980 lbs per acre.

The two together give, I think, a fair average for the whole 3½ acres though the crops of those two patches varied very greatly.

Characteristics—

Patch 1, thickly sown crop stood 5 to 6 feet high, ears small, average 3½ to 4 inches long by 5½ to 6 round the thickest part.

Patch 2, thinly sown crop stood 5½ to 6½ feet high, ears much bigger, average 4 to 4½ inches long by 6 to 7½ round. There was no difference in the kind of jowári sown ; the difference was due, I believe, to soil and accident—the accident being that in some places the sowing was thicker than in others.

Four acres of poorer soil had a fairly uniform crop of about 6 annas value. Cut 4 gunthás which were thoroughly characteristic of the whole :—

Result ... ... { Grain 14 *sers* or 140 *sers* per acre. / Kadbi 65 lbs. or 650 lbs. per acre.

Crop thickly sown stood only 4½ to 5 feet high, ears very small, average 2½ to 3 inches long by 4½ to 5 inches round.

Three acres of very bad soil had a very bad crop on it. Value 2 annas. Cut 6 gunthás—

Result ... ... { Grain 5 *sers* = 33⅓ *sers* per acre. / Kadbi 21 lbs. = 140 lbs. per acre.

Crop may have been thickly sown but came up very thinly indeed, average height 2½ to 3½ feet, ears very small, average 1½ to 2 long by 2½ to 3 round.

This enables me to obtain the total produce for the 10½ acres thus :—

Outturn of 10½ Acres.

	Grain per acre.	Total.	Kadbi per acre.	Total.
	Sers.	*Sers.*	Lbs.	Lbs.
3½ acres	260	910	980	3,430
4 acres	140	560	650	2,600
3 acres	33⅓	100	140	420
Total ...	.....	1,570	.....	6,450

Average per acre, grain 149½ *sers* or 299 lbs., Kadbi 614 lbs., or about a 6-anna crop.

This field was a perfect example of the kind of crop produced this year over a great part of this táluka. Good soil produced an 8-anna crop, fair soil 6-anna and bad 2-anna. The deficiency in kadbi was more noticeable than the deficiency in grain. I was astounded at the result of my experiment as regards the yield of grain. At first I judged by the kadbi and thought the crop would

turn out to be a very bad one. I don't believe that in an extremely good year the field as a whole would yield more than twice the quantity of grain, but I am sure it would yield more than three times as much kadbi. My experiment in rice leads to the same conclusion and so do the statements of the rayats, namely that this season in places where the crop has not been an absolute failure the yield in grain is much better than the kadbi would lead one to expect.

4. I had the whole of the kulthi thrashed and weighed. I was not present at the cutting which had been done before I reached Hukeri, but the whole was kept for me. The result, season considered, convinces me that it was not tampered with.

Result for 10½ acres, grain 79 *sers*, (each *ser* weighing 2 lbs. 8 tolás) = 174 lbs., or 16½ lbs. per acre.

The kulthi was not good and only sown in every eighth row on the poorest quality of land; it was practically a failure. Bhusa of kulthi in all 270 lbs. or 25¾ lbs. per acre. The bhusa is sold by the *jolgi*, a *jolgi* being a net which holds 130 to 140 lbs. as I found by practical test.

5. I found no less than 4 kinds of jowári :—

1*st*.—Red jowári or kemp jola, very little of it; said to be sown by mistake and not designedly; only occurred in single stalks here and there.

2*nd*.—A golden yellow kind called Gunda Teni.

3*rd*.—A dull yellow kind called Shadagar.

4*th*.—White called Bilachi or Pandré.

The last three kinds appeared to be in about equal parts.

6. The tur was a bad crop; the ambádi fair. I think instead of estimating its yield the value of the kulthi should be doubled and the total value of produce entered accordingly.

7. The assessment is 15½ annas per acre. The maximum dry-crop rate for Hukeri is Rs. 1-12-0. Therefore the class of this field is 9 annas as far as I can judge, an undeservedly high class. In 1882 Mr. Horsley experimented on a field in Hukeri 9 acres in area, assessed at Rs. 6, *i.e.*, 10⅔ annas per acre or 6-anna class. I have visited this field again this year. The greater part of the field is black soil though it has faults of stone slope and liability to be run over by water in parts. This year I should say the outturn per acre of the field Mr. Horsley experimented on is equal to that of the field I experimented on. It is interesting to note that the field Mr. Horsley experimented on has now gone over to the Sávkár and the holder cultivates it giving the Sávkár half the produce.

8. Method of cultivation and details for calculating cost.

The general rule about Hukeri is that good soil is ploughed every second year with an 8-bullock plough within a month of cutting the crop. Poor soil is ploughed every year with a lighter plough drawn by six oxen in April after there has been a fall of rain. The cultivator in this case says he treats half his field as good land and ploughs it every second year. I found, however, that before I left Hukeri he had ploughed up the part sown with bájri and navani with an 8-bullock plough and that part was not good land. I therefore assume that he treats ¾ of his field as good and ¼ as poor land. The land that is not ploughed just after reaping is harrowed with a 4-bullock harrow (*kunti* in Kánarese). The jowári stumps are left in the ground and not taken up until after the hot weather work just before spreading the manure. After the December ploughing and harrowing nothing is done until the early showers come about the Ashvini Nakshatra (middle of April). Last year there was a little rain at this time but not much—42 cents altogether in Hukeri. The first work is to plough up the poorer land with the six-bullock plough, then the rest of the land is harrowed with a big *kulav* drawn by 8 oxen once. Then the whole field is harrowed twice with the smaller kulavs drawn by four oxen, often two are worked at one time. Then the *balsal* or 2-bullock *kulav* is used once. Then the jowári stalks are picked out and afterwards the manure is spread. This year

only 15 carts at 8 annas a cart were used. If he could have afforded it, the cultivator would have used 40 carts, the latter being reckoned a fair quantity for a field of 14 or 15 acres. After that the *balsal* is again used to work in the manure, and afterwards comes the sowing. Two *kurgis* (Kánarese) or four-coulter seed-drills drawn by 2 oxen each. Behind each follows a man or woman with the *moghan* with which the tur or kulthi is sown. Behind that come two *balsals* drawn by 2 oxen each, and lastly comes the *henti* (Kánarese) or *phesati* (Maráthi) pulled by one man. The *phesati* is twice as broad as the *kurgi* or *balsal* and so only one is needed to the two *kurgis*. It is not so big as and not a permanent instrument like that in common use in Belgaum described in the notes to my rice experiment. It consists of a piece of a bamboo or wood with some small bábul or other thorny branches fastened to it. A month after sowing the *kolpa* is used twice. After that comes hand-weeding and finally harvesting.

9. Details for calculating cost of cultivation are:—

(1) Big plough, 8 oxen, 2 men; 1 acre ploughed in 4 days of 6 working hours each; no work done after mid-day.

(2) Plough of six oxen and 2 men; one acre ploughed in 3½ days.

(3) *Kulav* of 8 oxen and 3 men—one to lead, one to drive standing on the shafts, one to sit on the *kulav*; an acre in 2 days.

(4) *Kulav* of 4 oxen with one man; an acre in one day.

(5) *Balsal* of 2 oxen and one man; an acre in ⅛ of a day.

(6) Clearing the land of grass and jowári stumps, burning and spreading the refuse on the field; 5 men do 3 acres in one day.

(7) Loading, carting and spreading 15 cart-loads of manure; 5 men and one cart did the whole in 3 days.

(8) *Balsal*—2 oxen and 1 man did the whole field twice in two days.

(9) Sowing—2 *kurgis*, 2 oxen and one man each; 2 *moghans*, one woman to each; 2 *balsals*, 2 oxen and 1 man to each; 1 *phesati* with one man. The whole field done in two days.

(10) Seed—jowári 28 *sers*, tur 18 *sers*, and kulthi 16 *sers*.

(11) *Kolpa*—2 oxen and 2 men, 3½ acres in one day. Done twice at an interval of a week.

(12) Hand-weeding—only done once this year, 4 men to one acre a day.

(13) Cutting and stacking—2 men, 1 acre in 1 day.

(14) Cutting off the heads—30 women did the whole of the jowári in one day and received two *sers* of jowári each.

(15) 4 men pulled all the kulthi in one day. 3 men and 2 oxen threshed and winnowed it in one day.

(16) 5 men and 8 oxen threshed the jowári in one night. 4 men winnowed it the following day.

(17) 6 men are employed one day to make the threshing-floor.

(18) Grain and kadbi carted to cultivator's house by one cart in 2 days.

(19) Watching—two months before cutting and a fortnight after cutting.

(20) Share of produce to Balutedárs—$\frac{1}{12}$ of the jowári unthreshed; usually $\frac{1}{16}$ only is given, but this year the crop was not quite an average one.

Items 10, 13 to 18, and 20 apply to the area experimented on only, the rest to the whole field.

10. The actual payments in cash and kind were:—

(1) First weeding or clearing—20 men, one day, 2½ *sers* of jowári each.

(2) Rs. 2-8-0 for 5 carts of manure.

(3) For carting and spreading—4 coolies, 3 days, at two annas a day each.

(4) For sowing—4 coolies, 2 days, at two annas a day each.

(5) Seed—Jowári 14 *sers*, tur 9 *sers*, kulthi 8 *sers*, worth in all Rs. 1½.

(6) Weeding—50 men, 1 day, at 2 annas each.

(7) Reaping—Rs. 6 for the jowári and kulthi—wages at this time 4 annas a day.

(8) Cutting off ears—30 women, 2 *sers* of grain each.

(9) For threshing and winnowing—3 coolies employed a night and a day at 6 annas each.

(10) Watching—a hired servant, 2 months, at Rs. 4 a month. This man of course did other work also.

(11) Share of produce to Balutedárs—$1\frac{1}{2}$ of the jowári as it stood.

Items 5, 7, 8, 9 and 11 apply to the part experimented on only, the others to the whole field.

Everything else was done by the cultivator, his two brothers and 8 bullocks.

11. This field is rented by the cultivator who pays the owner half the produce. The owner pays the assessment, gives the cultivator half the seed and pays half the cost of weeding and of the manure.

12. Smut had attacked a few of the jowári ears. The local name of the disease is *kadgi* and the rayats attributed it to prevalence of mist when the ears were sprouting. There has been a good deal of it this season in the Chikodi Táluka.

13. After the jowári had been cut I made careful inquiries to ascertain the local estimate of the yield of the field experimented upon. It was 12 *herus* of jowári = 3,072 lbs. My estimate gives 3,140 lbs. The cultivator estimated it at 6 *herus*. His estimates are not to be trusted. He estimated the yield of kulthi at 28 *sers*, whereas it was 79 *sers*.

14. The prices on which calculations are based are—jowári 14 *sers* per rupee at date of experiment, and 21 at date of first instalment; kulthi 16 at date of experiment, and 22 at date of first instalment. Total amount (284 lbs.) of jowári-kadbi cut by me was, including price (one anna) of bhusa, worth Rs. 1-5-0 at date of experiment, and Rs. 1-1-0 at date of first instalment; price of bhusa did not change; kulthi-bhusa (270 lbs.) was worth Rs. 1-4-0. The great fall in prices was due to two causes:—

(1) At date of 1st instalment all the jowári and kulthi was harvested and a great quantity was for sale.

(2) The fear of great scarcity in the eastern districts was allayed by the rain at the end of December.

J. J. HEATON,
Assistant Collector.

Ordinary Experiment No. 3—Peas.

1. I attach no importance to this experiment, but it was the only chance I had of making an experiment in peas—the common second crop on the rice and about Belgaum.

2. The crop was excessively poor. I did not see any plant with more than three pods on it. Most of them had but one. The plants were injured by a small green insect called locally *hula*, but for this the yield would have been $2\frac{1}{2}$ or three times as great. The crop was very thickly sown, too thickly I think. The owner assured me that 8 *sers* of seed had been used for the five gunthás. I should say that not more than 6 *sers* ought to have been used.

3. The Survey No. (42) experimented on was divided into many small plots. The one I cut measuring 5 gunthás, had the best crop of the lot. None of the others were worth cutting.

4. The only expenses involved were:—(1) Ploughing before sowing, 2-bullock plough, one man; (2) Hand-sowing, one man; (3) Pulling the peas; it takes 8 men a day of 6 hours to do an acre—I found 8 men pulled the peas on the 5 gunthás in $\frac{3}{4}$ hour; (4) Threshing and winnowing, 1 man and 1 woman did the produce of the 5 gunthás in $1\frac{1}{2}$ hours.

5. In applying the results of this experiment to the experiment on rice (No. 3 in the Statement), I have assumed the produce of the second crop of land in Belgaum to be about $2\frac{1}{2}$ to 3 times as great as that in the experiment and put its value at Rs. 10 per acre.

6. It is difficult to know how to calculate the percentage for column 10. Comparing the land experimented on with that in Belgaum and from local inquiries I should say a fair yield of paddy per acre was 1,000 lbs., or that the value of the paddy, &c., was about Rs. 30 per acre. On this assumption then the total value of the produce per acre is Rs. 33-12-0 and on this assumption the percentage would be 10.

J. J. HEATON,
Assistant Collector, Belgaum.

Ordinary Experiment No. 4—Sweet Potatoes.

1. The whole of Survey No. 87 is garden land assessed at Rs. 5 per acre. Rs. 6 per acre is the highest garden land rate in the táluka. Soil of land experimented on, inferior; water-supply large and continuous.

2. Thirty-three and one-fourth gunthás were sown with sweet potatoes divided into 30 long strips of 9 feet width and 44 yards long called *chirás*. Took 3 of these *chirás* measuring 3¼ gunthás for the experiment. They were perfectly representative of the whole. Northern half of the plot had a better crop than the southern half said to be because the southern half was shaded. Whatever the cause, the difference was easy to see before the crop was taken up.

3. The sweet potatoes were of 2 kinds—1*st*, *Deshi* or *mulki* having a heart-shaped leaf and no deep indentations, roots rather small but sweet, sometimes coloured red; 2*nd*, *Vilâyati* introduced into Chikodi from Kágvád 15 years ago, leaves very deeply indented, roots bigger and never coloured red. The two kinds were so inextricably mixed that it was impossible to differentiate them and experiment on each kind separately.

4. Yield as follows:—Each *chira* was carefully measured into north and south halves and the produce weighed separately:—

Outturn—Sweet Potatoes.

	Northern half.	Southern half.	Total.
	Lbs.	Lbs.	Lbs.
1st *chira* pulled	173	126	299
2nd do.	190	133	323
3rd do.	185	140	325
Total ..	548	399	947

If the southern half had borne as good a crop as the northern half, the yield would have been 13,489 lbs. per acre. The yield was by no means a first-rate one. The roots were of medium size, not big. I estimate that a 16-anna crop would yield from 18,000 to 20,000 lbs. per acre. Mr. Price of the Southern Marátha Survey informed me that he experimented on sweet potatoes many years ago and obtained as the result a yield of 6,200 lbs. per acre. The crop I experimented on was the second crop of the year. The first was tág, but it proved a failure; so it was not pulled but ploughed into the soil as manure.

5. The crop was cultivated by two men in partnership—tenants of the Khátedár who paid half the produce as rent. Khátedár pays the assessment, provides half the manure and half the seed and pays half the cost of weeding. He also provides the *mot* (water-bag). This leathern bag costs about Rs. 8 and will last two years if thoroughly well oiled twice a year. The iron ring costs Rs. 1½ and lasts 8 or 10 years. This year the crop of sweet potatoes was sold standing for Rs. 60, Rs. 2 per *chira*. The purchaser undertook the cost of taking the crop out of the ground—not a small item, as two men working 4

hours a day only cleared one *chira*. This I found by actual test. That is, the purchaser obtained 315 lbs. of sweet potatoes for Rs. 2 + cost of taking up the crop, say 6 annas (labour is expensive about Chikodi, in March there are so many sugar-mills working), that is, he received 133 lbs. per rupee. The price in the Chikodi market was from 60 to 80 lbs. per rupee at the time of the second instalment. The price entered in the Form is the price actually obtained, that is, Rs. 2 per 315 lbs.

6. Method of cultivation :—

(1) The tág was pulled in the Hasta Nakshatra (end of September or beginning of October). It was ploughed in by an 8-bullock plough.

(2) Harrowed once with 6-bullock *kulav*.

(3) Do. do. 4-bullock do.

(4) The trenches are made by a small *kulav* about 10 inches broad called *khabbin kunti* (Kánarese) or *usáché kulav*. It is drawn by two oxen. The labour entailed is exactly the same as in preparing an equal area of land for sugar-cane-planting.

(5) Seedlings—that is, cuttings from recently pulled well grown tops of sweet potatoes. The number of cuttings needed is enormous ; so the labour must be very great ; cost, say, Rs. 1-2-0.

(6) Watering—the seedlings were put down at the end of October. Crop was ripe 7th March or 20 weeks after. One pair of bullocks and a *mot* can water about half an acre a day. The cultivator said he gave the crop two waterings a week. This I do not believe. From inquiries made at the time of the experiment I shonld say that not more than 30 waterings were given. That is, 45 days' work for 2 men and a pair of bullocks. As the crop is watered, the tops of the plant are raised out of the trenches to prevent soaking.

(7) Weeding—occasional and irregular. It is impossible to say exactly how much work it involved, say, 3 men for two days at a guess.

(8) Watching—not done by hired man.

(9) Taking up the crop—details given above ; 8 men would clear an acre in a day of 6 hours.

7. Of the two partners who cultivated this field one has one pair of bullocks and a son old enough to work (12 or 14 years). The other has nothing. The only actual cash outlay was Rs. 1-2-0 for seed and about Rs. 5 for borrowing cattle and instruments for ploughing and harrowing. The khátedár received Rs. 30 and the cultivators Rs. 15 each. The one without bullocks, or son, paid some part of his share to the one who had bullocks, &c. I do not know how much.

8. The tops were worth about one anna per *chira* as fodder. At a season suitable for planting cuttings they would fetch nearly half a rupee per *chira*.

J. J. HEATON,
Assistant Collector.

APPENDIX G.

Memorandum on Betel-vine Cultivation.

Ordinary Experiment by Mr. J. J. Heaton, referred to on page 16.

I can only give a very incomplete account of Pán garden cultivation, for, though I spent a great deal of time in making inquiries, I am not satisfied on many points.

2. An ordinary Pán garden is from 35 to 45 gunthás. This is as large a garden as can be watered with one *mot*. The garden is arranged into small plots averaging $\frac{2}{3}$ guntha in area (33 feet by 22 feet) called *chirás*. Each *chira* is divided into 11 smaller plots called *ankans*. I append (*see* page 86) a plan of a part of a garden with explanatory notes.

3. In the season before planting the Pán vines the area selected for the garden is sown with *tág* (Bombay hemp) or chillies, and no manure is used. These crops are supposed to prepare the land for a *pán* garden. This preliminary crop is taken up in due course, not ploughed into the soil. In the succeeding April or May the land is heavily manured, about 100 carts to an acre, and the division into *ankans* and *chirás* is made.

4. When the monsoon breaks, *i. e.* about the Mrig Nakshatra (5th June) cuttings of the trees, up which the vines are to be trained, are planted. These cuttings are generally obtained by cutting the tops of the trees in a garden near the end of its life. These trees are of four kinds. Their names are—

Maráthi.	*Kánarese.*
Pángára.	Halaval.
Shevgar.	Nagi.
Narchagti.	Chagti.
Agasti	Marachagti.

The names of four trees are given at the foot of page 32 of Mr. Fletcher's Pamphlet on Agriculture in the Deccan. These are—Hadga, Pángára, Shivri, Bakan.

On page 303 of the Dhárwár Volume of the Bombay Gazetteer three are mentioned, *viz.*, Nagi, Halival, Chavgachi, evidently the same as the first three in my list.

The leaves of all these trees are used as fodder. The Nagi has a fruit like an elongated cucumber which is eaten freely in curries, &c. These trees are all very slender and do not grow to any very great height—about 20 feet at the outside. These trees collectively are called *Cheddi*.

5. About two months after the cuttings of the *cheddi* have been planted, the cuttings of the *pán* vines are planted. These cuttings are generally obtained from a garden that has reached the end of its life. About 150 pán vine cuttings are planted per chira. As time goes on the number of vines is increased to about 180 to 200 per chira by training shoots from an existing vine up an extra *cheddi*. This amounts to about 9,000 per acre, not 2,000 as stated on page 303, Dhárwár Gazetteer.

6. From the moment the *cheddi* are planted the watering begins. Mr. Fletcher says the vines need water every fifth or sixth day. The Dhárwár Gazetteer says every eighth day. I believe that the vines need water twice a week from the beginning to the end, and I am not at all sure that they are not watered even oftener. For it is said, and I believe truly, that one *mot* can only serve about one acre. Half an acre can be done in a day so that to water one acre twice four days are necessary. The *mots* are not often lying unworked, and therefore I argue that the vines are watered at least twice a week. Like other delicate plants they need constant attention in other ways.

7. The garden is enclosed by a thick hedge of milkbush. Sometimes there is a double hedge. The hedge is planted, I believe, the year before the vines are planted.

8. After 1st planting the vines are allowed to grow at least fourteen months, that is, until the October of the year after this planting. From October or November until February or March according as there is a demand for betel-leaves the vines are stripped of their leaves excepting those at the top of the vine and the leaves at the end of each twig, that is, the growing points. As soon as a vine is stripped of its leaves it is layered, that is, coiled up and buried at the foot of its trainer with the uppermost 18 inches or thereabouts above ground. The tops of the vines are not cut off as stated in Mr. Fletcher's Pamphlet. About four months after layering the vines are about four feet high and small cuttings of the lower leaves are made. These cuttings occur monthly or every two months until October or November when the full cuttings begin. After each full cutting, of which there is one a year, the vines are layered, but at no other time.

9. Each vine is supplied with fresh earth and manure once a year at the beginning of the monsoon. The Dhárwár Gazetteer (page 303) states that manure is wanted 3 or 4 times a year. As far as I can learn the manuring is done only once a year.

10. This process is continued year after year. Summarized, it is as follows :—

(1) November to February-Full cuttings of the leaves of the vine. The cuttings are made according to demand and may begin in October and finish in March.
(2) Layering immediately after cutting.
(3) March or April to October—Monthly cuttings of the lower leaves of the vines as they come up sufficiently high.
(4) June—Supplying each vine with fresh earth and manure.

11. The best leaves are those cut at the full cutting in the cold weather. They are generally sent away to some big town for sale. The commoner lower leaves are used chiefly for home consumption, but are to some extent exported.

12. The Dhárwár Gazetteer states that a crop is yielded every three months. As far as I can learn, and I visited and made inquiries in six different gardens, there is one regular crop a year and four to seven small cuttings of lower leaves.

13. Both Mr. Fletcher and the Dhárwár Gazetteer state that the vines yield a crop in their third year. On this point I believe my information to be perfectly accurate. It is that a crop is yielded fourteen to eighteen months after planting and that subsequently there are the annual crop and the periodical small cuttings. The first crop is small, the second larger, in some cases the third crop is a full good crop, in other cases it is not till the fourth crop that a full yield is obtained.

14. The average life of a Pán garden is said to be 10 to 12 years. The last year but one the *cheddi* tops are cut and used for planting a new garden. The last year the yield is very small indeed. The tops of the vines are cut for planting elsewhere and the garden dismantled.

15. In calculating the yield of produce I have two experiments as guides—one Mr. Price made in January, of the result of which he was good enough to give me a full account; my own experiment of March, and information gathered from inquiries. As the leaves are cut they are made into handfuls averaging by 45 actual tests 115 leaves per handful. Three handfuls make what is called a *kavli* and 60 *kavlis* a *kudtán*, that is, a mill-stone-shaped package of leaves, that is, half a bullock load. Mr. Price in his experiment took a plot 26½ feet by 27½, not a perfect *chira*, though it was a plot of 11 *ankans*. In my experiment I took a plot precisely similar, measuring 27 feet by 27. The difference between the plot experimented on and a *chira* is explained in the plan. Mr. Price found 205 vines in his plot. I found only 179 in mine. A perfect *chira* would ordinarily have 3 or 4 vines less than the area Mr. Price and myself experimented on. Result of Mr. Price's experiment—114 *kavlis*=39,330 leaves. Result of my experiment— 149 *kavlis*=51,405 leaves.

The leaves are ordinarily sold by the *kudtán* (60 *kávlis*), and in estimating the yield of a *chira* the estimate is commonly made in *kudtáns*. From these two experiments and from my enquiries I have come to the conclusion that two *kudtáns* = 120 *kavlis* = 41,400 leaves per *chira*, is a very good yield—take a garden all through. The price of leaves when Mr. Price made his experiment (3rd January) was Rs. 3¼ per *kudtán*. The price at the time I made my experiment was Rs. 2½ per *kudtán*. The leaves I actually had cut were sold at 29 *kavlis* for Rs. 1-2. The price was low because the leaves had remained on the vines rather too long owing to absence of purchasers. This year, it is to be noted, the price of *pán* leaves is low and the demand is much less than usual. The reason assigned is that there will be no marriages amongst Bráhmans this year.

16. The total yield of the small periodical cuttings is said to equal the yield of the full cutting; the leaves are worth about ⅔rds as much. This is an estimate based on the result of inquiries only. I cannot see how it is to be checked, for the cuttings are too irregular and too frequently recurring to make an experiment possible.

17. The actual area of the garden experimented on is 38 gunthás. It contains 55 *chirás*. The outermost *pán* vines bear very little. They are not regarded as profitable but as a protection. This garden had 78 outside *ankans*, say, seven *chirás*. Their yield at the utmost could not be more than the yield of 2 ordinary *chirás*. For yield purposes, therefore, I regard the garden as equal to 50 *chirás*. Then I calculate each *chira* yields two *kudtáns* of best leaves worth Rs. 3 a *kudtán*, and two *kudtáns* of inferior leaves (leaves of the small cuttings) worth Rs. 2 a *kudtán*; total yield per *chira* is 4 *kudtáns* = 82,800 leaves worth Rs. 10. The area experimented on was 38 gunthás and had the equivalent of 50 *chirás*. One acre would therefore hold about 58 *chirás*, in all equivalent, say, to 52½ *chirás* yielding a full crop.

18. I made extensive inquiries about the yield of the first and second crops and have come to the conclusion that the first full crop of a *pán* garden is ½ a *kudtán*; the second, one; third, 1½; and fourth, 2 per *chira*. Take the garden experimented on and suppose its life includes 10 full cuttings :—

1st full cutting	½	*kudtán* per *chira*.		1st set of small cuttings		½	*kudtán*.
2nd	1	,,		2nd		1	
3rd	1½	,,		3rd		1½	
4th	2	,,				2	
5th to 8th, 2 each.	8	,,				8	
9th	1	,,				1	
10th	¼	,,				¼	
	14¼					14¼	

14¼ *kudtáns* at Rs. 3 per *kudtán*	= Rs.	42	12	0
14¼ ,, ,, 2 ,,	,,	28	8	0
	Rs.	71	4	0

The garden has the equivalent of 50 *chirás*, therefore the yield of the garden is Rs. 3,562-8-0 or Rs. 356 per annum.

I believe that the estimate in *kudtáns* of leaves is a very fair one, but I am inclined to think that the average price of betel-leaves (best) is more than Rs. 3 per *kudtán*.

19. The man who cultivates the garden has the whole survey number measuring 8 acres 19 gunthás. He cultivates about 2 acres of it, besides the *pán* garden, chiefly growing jowári, sometimes a small patch of maize, chillies or other things; the rest is waste. The rent he pays is Rs. 55 a year. He keeps 6 servants to work in his field and one pair of bullocks. Cash payments therefore are :—rent Rs. 55; 6 servants, averaging Rs. 3¼ a month each, Rs. 234; total Rs. 289, together with all sorts of other incidental expenses that are, I should say, covered by the produce from the rest of his land and the plantain trees of which there are a few in the *pán* garden.

20. I should say that in this case the man clears at least Rs. 70 a year after feeding himself and bullocks. It is to be noted that a *pán* garden is never cultivated alone; it always has other land attached to it. The reasons are that with 5 or 6 servants there must frequently be not enough work for them all in the *pán* garden, and secondly, land is needed to give the annual supply of fresh earth.

21. The cost of cultivation could only be determined with any approach to accuracy by making a special crop experiment on a holding including a *pán* garden. Cultivators of *pán* gardens always have five or six servants constantly employed on the *pán* garden and adjoining land. I did not make my experiment till 12th March, by which date all the crops on the dry-crop portion of the holding had been cleared off. As a rough estimate I would put down the rent Rs. 55 and the wages of servants Rs. 234 as the share of the *pán* garden and other incidental expenses, that is manure, occasional extra coolies, &c., as the share of the rest of the holding. The pair of cattle are fed on the fodder supplied by the *pán* garden and dry-crop land jointly. This is very rough estimate indeed, but the best I can make now. Next year I hope to be able to do a special experiment on a holding including a *pán* garden.

22. The area experimented on was only about $\frac{2}{3}$ guntha. The minimum area prescribed for garden cultivation is 3 gunthás. An experiment on 3 gunthás of a *pán* garden would involve two entire days spent in the garden, and an undertaking to purchase all the leaves cut, as it is very unlikely a trader in *pán* leaves would come prepared to purchase the produce of 3 gunthás (9 *kudtáns*) at once.

23. Forty-five handfuls of leaves or 15 *kavlis* were weighed; result $302\frac{3}{4}$ ounces. The weight of a *kudtán* is therefore 1,211 ounces = 75 lbs. 11 ounces.

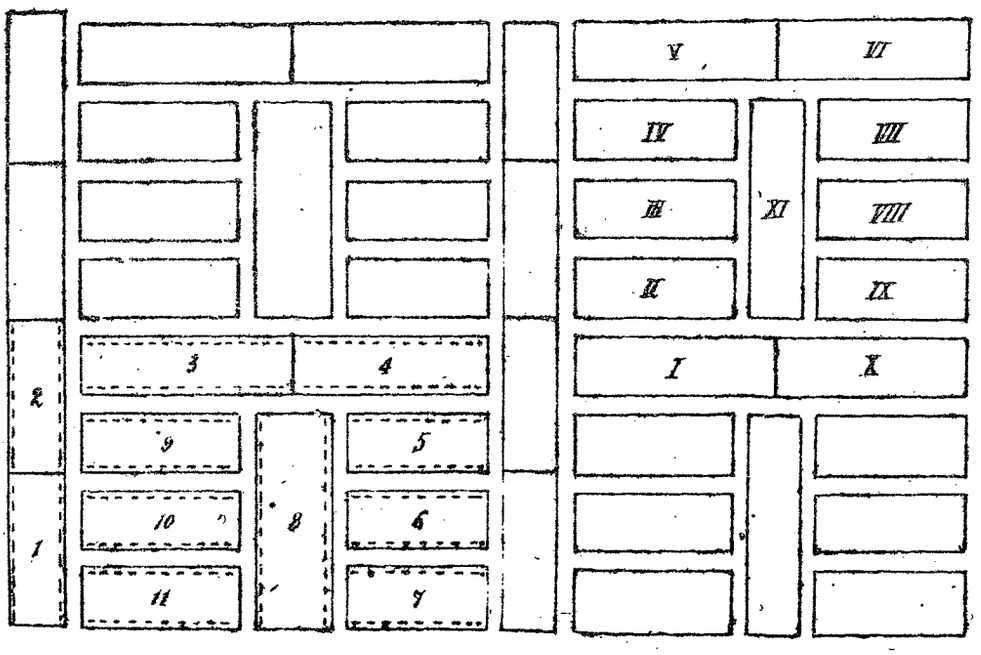
24. An acre contains the equivalent of $52\frac{1}{2}$ *chirás* bearing a full crop; yield per *chira*, 4 *kudtáns* worth Rs. 10.

25. I have not been able to make any allowance for the yield of fodder and plantains. To obtain a fair estimate will involve further inquiry.

J. J. HEATON,
Assistant Collector.

Plan referred to on page 83.

Plan of four Chirás.



The rectangles enclosed by black lines are the *ankans*. The plan shows 44 *ankans* or 4 *chirás*. The *ankans* of one *chira* are numbered 1 to 11 to clearly mark the *chira*. The vines are planted in rows along the longer sides of the *ankans* as shown by the dotted lines in one of the four *chirás*. They are planted in small *bándhs* which enclose each *ankan*, leaving the centre at a lower level. Water runs along the water-channel between the *ankans* and also inside each *ankan*.

The plan of a plot such as that experimented on by Mr. Price and myself is marked with Roman figures. The plot includes 11 *ankans*.

J. J. HEATON,
Assistant Collector.

Extract from Mr. W. S. Price's letter dated 21st June 1885, regarding Betel-leaves.

Pán leaves—Experiment in Chikodi.—My experiment in this is not a complete one, as it does not show what the produce for the whole year is from a given area; but it may come of use if coupled with other experiments made at other stages of the growth of the vines.

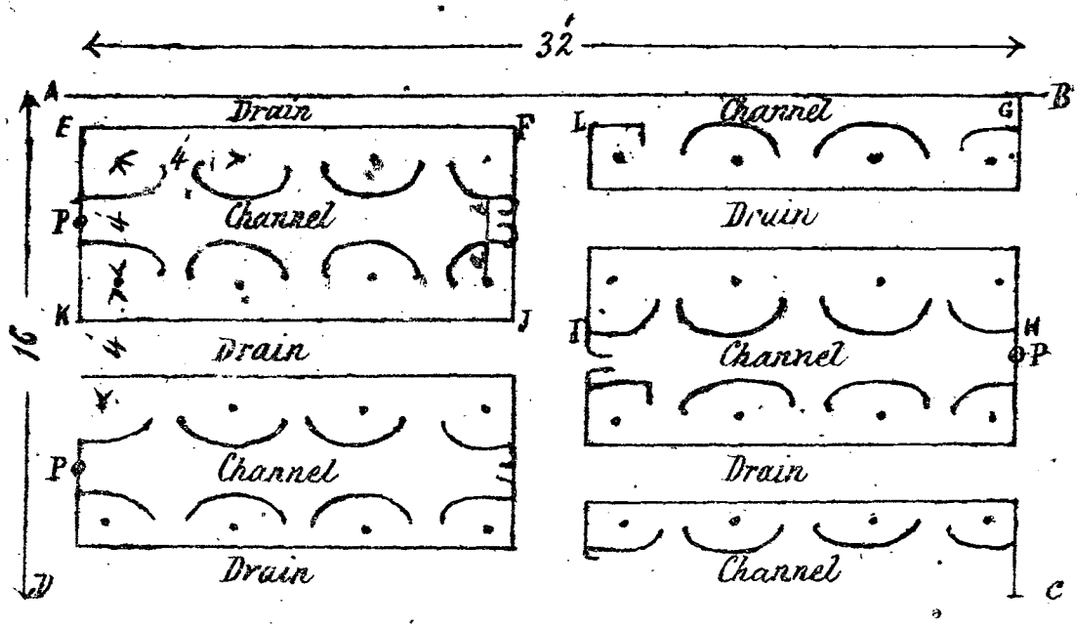
Experiment in last January when the vines were at their full growth. After this produce was taken off, *i.e.*, the leaves plucked off, the vines were taken down from the poles on which they were growing coiled up and layered in a trench at the foot of the poles. After this layering the vines start into fresh growth for another year. Area of experiment $26\frac{1}{2}$ feet $\times$ $27\frac{1}{2}$ feet $= 728\frac{3}{4}$ square feet. In this area, No. of vines 205, No. of leaves 39,501, weight of these 160 lbs. 5 ozs.

According to this the produce of an acre would be 2,361,116 leaves, No. of vines $12{,}253\frac{1}{2}$, weight of leaves 9,582 lbs. 7 ozs. After this picking the vines are lowered and layered, as I have said, and they start into fresh growth. From this stage to the end, *i.e.*, to the stage of my experiment, pluckings of leaves take place from the same vines at intervals of two months. But whether each of these pluckings are equal or less in number of leaves to the plucking of the full growth stage, I could not ascertain with certainty. They are not more, I believe, and I am inclined to think they are less. Mr. Heaton in Belgaum has interested himself in this produce, and will, I believe, be able to, by next year perhaps, come to a fair conclusion regarding the yield from it.

Notes by the Director of Agriculture on Betel Vine cultivation at Shiggaon, Dhárwár District.

The preparation of the land for a new crop is as follows:—The land is dug with a pick about knee-deep in the cold season following the rains. If possible the work should be over early, so that the weeds and grass brought up may have time to die thoroughly before any showers come. In this part of the district hot weather showers are frequent. If the land is covered with *kunda*, *hariáli* and other deep-rooted grasses, more care is required. The roots are carefully gathered, heaped and burned.

In the monsoon, generally about the 15th July, though often earlier, the cuttings for new vines are planted. These are the uppermost shoots of old vines and are in length about 2 or 3 feet. The arrangement of the beds is regular.



AB=32′ BC = 16′. Distance between any two adjacent vines 4′. The regularity is not in practice so great.

EFJK contains 16 vines and is styled a "*kale*"=a single bed. Two *kales*, one opposite the other, with the main irrigation channel dividing them (*e.g.*, EFJK, LGHI) make one "*mumba*" = a double bed. The diagram shows that a channel is always opposite a drain in the *mumba*. There may be any number of *mumbás* in a pán mala (garden), but each series of *mumbás* side by side has a main water drain completely surrounding it.

First the *mumbás* are lined out. Then each *kale* is taken in turn. The channel is dug deep about 2½ feet and all the earth piled on each side to raise the ground on which the vines and standards are finally to be fixed. This done, deeper trenches are dug crosswise across the channel to join the places marked for vines (Diagram *a*, *b*). Cuttings are then brought and laid carefully in this cross trench, two each way, each pair rising out of the ground at the points *a*, *b*. The rest of the shoot lies along the trench and is kept in its place by a handful of loose earth. The ends of each pair thus meet half way across the channel. Over this spot are placed two handfuls of manure and over the manure some mango or other dry leaves are heaped to keep off the sun. Each bed is thus provided with cuttings of vine, and as each bed is finished, water is let on morning and evening, unless there is rain, for 20 days. After 20 days the cuttings are examined. If they or any of them have not shown signs of sprouting, new cuttings are put in their places with manure as before.

At this time too the live standards are planted. On the ridge between the drain and the spot, whence each pair of vines protrudes, a small furrow is made by hand and 10 or 12 seeds of *agasti* and on the other side of the spot two seeds of *pángára M.* (halvál *K.*) are sown.

But before thus planting the seeds half the earth from the ridge formed from the excavation of the channel is put back into the channel by hand, but none is thrown into the small trench in which the vines were laid.

The standards grow very rapidly. Watering is necessary twice daily—unless there is rain—from the tank if possible, if not from the well—for 3 or 4 months, then once a day till the first crop, then once a week.

As the vines grow they are first trained along small poles 3 or 4 feet long, to the standards, being tied at about every 6 inches with strips of plantain leaf. When the vine has grown to the living standards these dead supports are removed.

The vines are manured every two months. The leaves and earth covering the roots are removed and the manure put on and the trench is filled again as before. This manuring in small doses is kept up till the vine is removed.

In or about the second February following, *i.e.* about 1 year 8 months after planting, the first crop of leaves is plucked, but about one month before, the vine, which may be 6 or 7 feet high, has all its bindings loosened and the part nearest the ground is carefully coiled and the coil buried in the channel on one side. This is to prevent too high growth and to give larger extent of root. To coil the vine the superincumbent earth is removed as well as the bindings, and the different vines—the two may have increased by other growths to 5 or 6 by this time—are gathered together and most carefully coiled (coil about 1 foot in diameter) and the coil buried flat and earth and manure put over it.

In a month all the lower leaves are cut (half these are bad, half are saleable), and of the upper leaves the smaller one of doubles is removed. The cutting is done with a sort of iron thumb nail tied on the right thumb.

After this another crop is taken about June and a third late in August, but some time before east winds begin.

To summarize—

Planted in July, say, 1885.
Coiled in January 1887.
First crop in February 1887.
Second crop in June 1887.
Third crop in August 1887.

and so on yearly, 3 crops per annum.

Each year before the first cutting of leaves the bands are loosened and the lower portions of the stem coiled. In the first year of coiling the coil is put on one side, in the second on the other, and in the third higher up on the raised bank. In the 4th the stems are too thick to allow the coil to be easily buried and it is made rather larger in circumference and left above ground.

The yield of the year after the first coiling is the best and the next year's yield little inferior. The third yield is good but the 4th and 5th are less profitable.

When the vine has cropped for 5 years, it is left alone for 2 years. This fallow is necessary, it is said, to allow the soil to recover. The land is neither weeded nor dug—any cultivation would only strengthen the grass which by this time has full possession. After the fallow, as stated in the 1st paragraph, the whole land is dug deep with the pick and all grass completely removed and burned or left to rot.

The standards require a few remarks. They grow very fast but the *agasti* fastest. It is useful therefore in the first 2 or 3 years. It is not so long-lived as the *pángára* and so in the 4 or 5 years none of the *agasti* remain. The *pángára* reaches a fine growth about 3 inches in diameter or more, and in the older vines there is often or generally only one of the *pângárás* left of all the standards. When the fallow begins, the standards left are cut down and sold. Those cut away at the yearly coiling are used for fences and the like.

The vine is never allowed to grow more than 12 feet high. Its height is regulated by the coiling of the lower portion of the stems.

The plantain is indispensable in a betel vine garden. Strips of the stem are used as binders and the leaves to protect young vines from the sun. I found that there is one plantain always grown yearly in each bed at the end of each channel, as shown in the diagram at P. P. P., so there is 1 plantain to 16 separate vines.

The old trees are cut yearly and new suckers come up in their places.

Supári trees are here and there grown on the sides of the main water drains round the series of double beds, but there is no regularity.

Cocoanut trees are more frequent and necessary. The leaves are required to protect the plants up to 3 or 4 years old from the sun in the hot weather.

Here and there chillies, *papayás* and the like may be seen, but the better the cultivation the less they are seen.

As regards soil, the chief requisite is a fine division, so stony soil is useless. Black and red mixed soil is considered the best if free from gravel and stones.

Position.—Good drainage is very essential. Besides the net work of drains between series of double beds there is always a deeper drain on the borders of the garden to carry off excess water. Therefore a high level is an essential to a good garden.

Water.—The watering is very frequent and carefully regulated. Each garden must have a well, but the cultivation is not profitable unless there is a good tank which can be depended on for several months. It would not pay to well-irrigate all the year, because the water-level is very low, 40 – 50 feet, and water-lifting very costly.

Rotation.—Each garden is divided into series of double beds. Each series is of a different age from the next. So there is always fallow in 2 plots, and 1st 2nd, 3rd, 4th, 5th, 6th and 7th year, vines in others.

One man, it is said, is required for 75 *mumbás* = about 500 vines, and his whole time is taken up.

Upper leaves are always best, but they are sold mixed, lower and upper. The sellers go as far as Belgaum, 80 miles. The leaf at Shiggaon has a very pungent taste, much more so than the Poona leaf.

Brackish water is not good.

E. C. OZANNE,

Director of Agriculture, Bombay.

January 1885.

I have thus brought together the results of observations and experiments made in the Belgaum District by Messrs. Heaton and Price, and in the Dhárwár District by myself.

The betel-vine is cultivated also in the Poona, Násik, Kánara and Thána districts. Short accounts will be found in the Gazetteer volumes.

A short extract of Dr. Balfour's account (Cyclopædia of India, Vol. 1., p. 399) will not be out of place—

"The Piper betel belongs to the pepper family of plants and furnishes the celebrated leaf of the Southern Asiatics. ..... It is very easily reared in the Indian Archipelago, but in the Peninsula of India it requires manuring, frequent watering, and great care, and in the northern parts of Hindustan it becomes an exotic very difficult to rear. The vine affords leaves fit for use in the second year and continues to yield for more than thirty, the quantity diminishing as the plants grow older. The leaf mixed with betel-nut and quick lime forms a hot and acrid masticatory and is in common use in India."

The cultivation in various parts of the Presidency presents many common features, but at the same time some, which are peculiarly characteristic of certain tracts. Thus whereas in Kánara, Násik, Poona and Belgaum the vine has a life of from 12 to 35 years, in Dhárwár its life is 7 years and in Thána only two and a half. In fact the vines are taken down in Thána at the age when in the other places the earlier crops of leaves are being plucked. Again whereas in the Deccan and Southern Marátha Country quick-growing trees are reared to serve as live standards up which the vines are trained, in Kánara mango trees are utilized as standards and in Thána live standards are unknown. In Tenasserim according to Dr. Balfour tall forest trees on the uplands, bared of all side branches, are the supports up which the vines climb. This feature in Thána appears to have no analogy elsewhere. It remains to be seen whether the very heavy rainfall would induce a too rapid growth of the live props, or whether, as is supposed, the props would not devour an undue share of the expensive manure used for the vine (castor oil cake imported from Gujarát), or whether the short life is not due to the palpable fact that the dead props of the kárvi reed and thin bamboos, themselves requiring for their own support one or two cross stages of bamboos, after $2\frac{1}{2}$ years rot and fall, taking the vine with them. Again in every garden a rotation is observed in Dhárwár and Thána, in the former of 9 years as described above, and in the latter of 4 years, while in other districts this feature is absent.

As in Dhárwár so in Thána the years of cropping are followed by a fallow, though in the latter district it is a fallow of only $1\frac{1}{2}$ years. In both places the land is untouched during the fallow ; any cultivation would only strengthen weeds. In Thána, however, by the use of ráb, *i.e.* by burning layers of cowdung and the like on the ground in the hot season of the fallow, the land produces a crop of rice seedlings which are planted out in rice fields. I may incidentally remark that this application of the practice of ráb adds much force to my contention elsewhere expressed, that the characteristic of ráb is its power of preventing weeds.

In the Deccan the crop is irrigated from wells only. The channels (*páts*) from streams are considered injurious. In Belgaum the Deccan practice is followed. In Dhárwár the cultivator relies chiefly on stored tank water, but is obliged to supplement this source from deep wide wells. In Thána all irrigation is from small hollows or tanks, supplied by rain-water and by percolation from higher levels. Any attempt to dig wells would be fruitless, for the water would be too salt.

As regards the number of vines per acre the evidence is conflicting. Mr. Price's estimate amounts to 12,000, Mr. Heaton's to 9,000 in the same locality. This latter appears more correct. I found that in Dhárwár about 2,500 double vines are planted, or about 5,000 single vines. No doubt the number increases as the crop grows older. The estimate of the Dhárwár Gazetteer is apparently wrong, because the custom of planting the cuttings in pairs was overlooked. In none of these estimates however is the space occupied by roads, sheds, hedges and the like fully accounted for. For practical calculations a deduction of 15 or 20 per cent. for such areas would not be excessive. In Thána, were the whole acre covered as fully as each bed, the number of vines would be about 10,000.

I hope to be able to place on record next year in this compilation further details regarding this interesting cultivation.

E. C. OZANNE,
Director of Agriculture, Bombay.

April 1886.

Remarks of the Divisional Commissioners.

No. 1456 of 1886.

REVENUE DEPARTMENT,

Thána Districts,
Camp Dahánu, 4th May 1886.

The undersigned has no remarks to offer beyond noting that the experiments in the Northern Division are not as satisfactory as they might have been.

2. The attention of the Collectors was called to the necessity of increasing the number of experiments when the report of the Director for the Crop Experiments of 1883-84 was received, but without much effect.

3. The orders on the subject will be reiterated for the coming year, and it is hoped more heed will be paid to them.

W. B. MULOCK,
Acting Commissioner, N. D.

No. $\frac{R}{1858}$ of 1886.

FROM

THE COMMISSIONER, C. D.,

To

THE SECRETARY TO GOVERNMENT,
Revenue Department.

Poona District,
Camp Purandhar, 6th May 1886.

SIR,

I have received from the Director of Agriculture a copy of his Report on Crop Experiments for the year 1884-85. Being only in temporary charge I should have preferred to have reserved this report for Mr. Crawford's remarks, but as Mr. Ozanne expresses a wish that his report should receive attention as early as possible, I offer the following remarks with some reluctance.

2. I observe that the only officer in this Division whose work is considered to be deserving of special mention by the Director of Agriculture, is Mr. Lamb, Assistant Collector, Khándesh. The work as done in Násik, is, on the other hand, regarded as the least satisfactory by the Director. The remarks in paragraph 6 of Mr. Ozanne's forwarding letter should, I think, be communicated to the Collector of Násik for his remarks and the future guidance of his Assistants.

3. Mr. Ozanne has taken much pains to place the results of the experiments before Government. The results though to some extent vitiated by the flaws brought to notice, will not be found uninteresting. It should however be enjoined on all officers engaged on such experiments to be very particular carefully to follow the rules and formulæ prescribed for their guidance, so that the results presented may be of uniform value. Instructions to this effect were last year issued in this Division to all Collectors; that it should be necessary to repeat them is to some extent the result of requiring officers without special training or liking for the work to undertake experiments demanding difficult enquiry and delicate analysis.

I have the honour to be, &c.,
W. A. EAST,
In charge Commissioner, C. D.

No. 1586 of 1886.

From

W. H. PROPERT, Esq.,
Commissioner, S. D.;

To

T. D. MACKENZIE, Esq.,
Acting Secretary to Government,
Revenue Department.

Poona, 16th June 1886.

Sir,

The Director of Agriculture has forwarded to me a copy of his printed Report on the Crop Experiments made in the Presidency proper during 1884-85, with a request that I should submit my remarks thereon to Government as early as possible.

2. Mr. Ozanne has so carefully and minutely collected and analysed the results of the experiments, both ordinary and special, carried out in the several districts of this Division, and his remarks are so full and comprehensive, that I have but little to add to his exhaustive report.

3. As anticipated by Government in the review of the report for 1883-84, a marked improvement is apparent in the statistics collected during the year under report, though the results arrived at in some cases are opposed to the figures for calculating the outturn of produce given in the formulæ prepared by the sub-committee on Huzúr Form No. 17 H. Mr. Ozanne doubts the accuracy of the formulæ if the results of yield reported by the experimenters are assumed to be correct, and asks for a special inquiry on the subject. This proposal I fully support, as also Mr. Ozanne's suggestion that a modification should be made in the standing orders regarding the method of calculating cost of cultivation. I am convinced however that the task of satisfactorily ascertaining the real "cost of cultivation" except in comparatively rare cases is a hopeless one, and this I think has been found over and over again.

Government Resolution No. 69 of 7th January 1885, paragraph 2.

4. I approve of the insertion of an additional rule to ascertain the equivalent in lbs. of the quantity of grain given in column 18. The memorandum referred to in paragraph 8 of the Director's forwarding letter to Government is well calculated to ensure the correct filling in of the form prescribed for the Crop Experiment Report; but I fear it will throw an amount of additional labour on the experimenters.

No. 889,-dated 13th April 1886.

5. I have called upon the Collector of Kolába to explain why the conduct of crop experiments was entrusted to an officer below the rank of Deputy Collector contrary to standing orders. The explanation on receipt will be submitted to Government.

I have the honour to be, &c.,

W. H. PROPERT,
Commissioner, S. D.

No. 4755.

REVENUE DEPARTMENT.

Bombay Castle, 3rd July 1886.

Letter from the Director of Agriculture, No. 889, dated 13th April 1886—Submitting the analysis of crop experiments made in the N., C. and S. Divisions in the year 1884-85.

Memorandum from the Commissioner, N. D., No. 1456, dated 4th May 1886.
Letter from the Commissioner, C. D., No. R.—1858, dated 6th May 1886.
Letter from the Commissioner, S. D., No. 1586, dated 16th June 1886.
} Submitting their remarks on the report by the Director of Agriculture on crop experiments for 1884-85.

RESOLUTION.—The report on the crop experiments for 1884-85 has been submitted later than usual, but Mr. Ozanne has explained the cause of this, and his explanation is accepted. The experiments were generally conducted in accordance with the rules laid down in Government Resolution No. 3289, dated 22nd April 1884, and although in some instances, notably in Násik, it appears that the instructions either were not understood or were neglected, yet on the whole considerable progress has been made in dealing with this difficult subject, and in some cases really valuable results have been obtained. Mr. Ozanne has carefully and fully reviewed the experiments, and deserves the acknowledgments of Government for the way in which he has summarized the results. He specially commends the officers named in the margin, who have shown particular care and interest in this work. In specially commending these gentlemen Government desire to assure other painstaking experimenters that their labours have not been overlooked. The results obtained in Násik are so unsatisfactory this year as indeed they were in 1883-84 that for the purpose of testing the accuracy of the formulæ Government are pleased to direct that each Assistant and District Deputy Collector should conduct six experiments in order to ascertain the average yield per acre of wheat, bájri and jowári, and they expect a careful attention to the rules promulgated last year, and to the remarks by the Director of Agriculture in his report now under consideration.

Mr. J. F. Muir.
„ R. A. Lamb,
„ J. J. Heaton.
Mr. A'darji Jivanji.
„ K. R. Vaidya.

2. Mr. Ozanne has shown good cause why the cost of cultivation can better be calculated by the officers making ordinary crop experiments than by himself, and Rule 4 relating to such experiments may be modified according to the Director's suggestion. The additional rule proposed by Mr. Ozanne in the last paragraph of page 8 of his report should be adopted as it will ensure the correctness of the measures of capacity used in the experiments.

3. The Governor in Council must again impress on all officers concerned the necessity of care and attention in making crop experiments. The absence of such care and attention to the rules entails waste of time and labour, and gives absolutely valueless results. Besides the importance of the results in connection with the incidence of the land revenue and the condition of the peasantry, the habits of observation formed and the information about agriculture gained in making the experiments are invaluable to Government officers and the evidence of accuracy, patience and intelligence or the want of them which the experiments afford, is carefully noted by Government.

T. D. MACKENZIE,
Acting Secretary to Government.

To

The Director of Agriculture,
The Commissioner in Sind,
The Commissioner, C. D.,
The Commissioner, N. D.,
The Commissioner, S. D.,
All Collectors in the Presidency proper,
The Survey and Settlement Commissioner.
} With copies of the report.

The Government of India,
The Secretary of State for India.
} By letter.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1885-86.

[*Price—Two Annas Six Pies.*]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1885-86.

No. 2422 of 1886.

From

E. C. OZANNE, Esquire,
Director of Agriculture,
Bombay;

To

The SECRETARY to GOVERNMENT,
Revenue Department.

Poona, 29th October 1886.

Sir,

I have the honour to submit herewith through the Commissioners of Divisions the usual analysis of crop experiments carried out by Revenue Officers during the year 1885-86.

2. Expenditure on crop experiments was interdicted on account of financial pressure in Government Resolution No. 4466, dated 3rd June 1885, but a small sanction was afterwards granted for the conduct of experiments on selected crops in selected districts (Government Resolution No. 86, dated 7th January 1886). The number of experiments is therefore small—too small to justify attempts at generalizations of results. I submit the reports for record and for reference, with a request that the compilation may be circulated as usual.

3. I have separately solicited orders that to ensure correctness in the calculation of the equivalent in weight of the contents of the local *ser* of capacity, experimenters may be requested to send with the bill of costs samples of the grain experimented with; each sample being a full local *ser*, measured as directed by standing orders. This request was necessitated by inaccuracies still abundant, arising from misapprehension and confusion such as that described in pages 8 and 9 of the report for 1884-85.

4. There is one other point on which orders are requested. Column 12 of the standard form prescribed for the use of experimenters, demands the entry of the local estimate of the crop in annas. It has been found that various and contradictory interpretations have been made regarding this estimate. It is clearly intended that the estimate should throw light on the incidence of the assessment on the gross value of the produce, and not on the character of the crop of the field experimented upon, in comparison with other similar crops of the táluka or village or holding. Such comparison is of course very valuable and should not be neglected. But the special entry in the estimate column should be an estimate of the crop actually tested in comparison with the produce of other years of the same field. The entry should mean that the crop is so much below or above or is equal to the average yield of that field. With this estimate the incidence shown in column 29 will be explained. The variation of custom regarding the figure in the anna scale chosen to denote an average crop causes another complication. Whereas in the Presidency it is usual to denote such a crop by 12 annas it is in some places the custom to denote the average crop by 16 or 14 annas. The 'remarks' column should therefore contain an explanatory note thus: "Average crop locally denoted by——annas. The crop experimented on is estimated as shown in column 12 at——annas for the field of experiment." Then should follow comparison of the crop of this field with other similar crops of the season in the holding, village or táluka.

5. I have endeavoured to bring together in this analysis the results of former experiments on the selected crops and to compare the results obtained with the figures of the Crop Formulæ. As has been noticed (paragraph 5 of report submitting experiments of 1883-84), one of the main objects of the experiments is to throw light on the correctness or otherwise of the formulæ

estimates. Till the average yield of the various crops in various tracts is approximately known, all attempts at calculating the yield of even the food grains of the Presidency will be futile.

6. Some confusion has arisen from the use of the word 'special' in the directions regarding the experiments on selected crops in selected tracts. Some experimenters thought that they were called on to make "special" experiments within the meaning given in the standing orders but only "ordinary" experiments were required. A "special" experiment on any particular crop would be meaningless, for the "special" experiment is by the definition an experiment on a holding.

I have the honour to be,
Sir,
Your most obedient Servant,

E. C. OZANNE,
Director of Agriculture.

ANALYSIS OF CROP EXPERIMENTS.—BOMBAY PRESIDENCY, 1885-86.

A.—Selected Crops in Selected Districts.

(1) Wheat.

This crop is attracting special attention owing to the export demand that has arisen of late years. An attempt was made this year to secure specially careful experiments in the principal wheat growing centres in order that light might be thrown on differences in characteristics, modes of cultivation and yield. Experiments were made in Ahmadabad, Khándesh, Násik and Dhárwár.

2. *Ahmadabad.*—Wheat is largely grown in the western tálukás of this district and in the adjoining tracts of the Káthiáwár States, and it is also largely exported.

3. The irrigated variety—*vájia*—is a soft red. The dry-crop or *chásia* varieties are the *dáudkháni* hard white and the *kátha* hard red. The latter is usually grown continuously and without manure on land locally called "bhál" land which is more or less impregnated with salt. It is a hard red with a very short straw, so short indeed that it is not customary to bind the pulled crop into sheaves. The *dáudkháni* is grown on black soil alternating with cotton. It is seldom manured and except that it is a white wheat, differs little in characteristics from the other chásia variety. The *vájia* or irrigated kind is generally manured and is taken in rotation with other crops. In Broach and Cambay in "bhál" land the same continuous unmanured *kátha* is common but in Hánsot táluka of Broach and in Olpád of Surat a very fine quality of hard white wheat is largely cultivated. It is styled *Hánsia*, and is locally prized both on account of its colour, and its keeping qualities. The local demand is so great that it does not find its way to the export market. Here and there it shows a tendency to change of colour and consistency. Where it assumes a reddish tinge—probably in certain soils, it is called *kátha*, but this *kátha* is quite distinct from the *kátha* of the "bhál" land. Where in a season of large rainfall it is softer than usual, it is called *potha* and is then very similar to *dáudkháni*, though the grain is larger.

4. In Khándesh the dry-crop wheat is a hard red with a large grain, while the irrigated kind is a hard white called *Bansi* though this latter apparently (*see* Experiments Nos. 8 and 9) is grown as a dry-crop also. In Násik and Ahmadnagar the unirrigated variety is generally a hard white or yellow (*pivla*) though in some soils it is red (*kátha*). In all three districts wet seasons produce a softer kind which is, as in Gujarát, called *potha*. In Khándesh both dry-crop and irrigated wheat are taken in rotation with other crops and manure is applied to wheat or to some other crop of the course. On the other hand in Násik and Ahmadnagar the dry-crop wheat is not manured, though it is not grown continuously. In black soil it takes its turn with other rabi crops such as gram and jowári. In lighter soil it is grown alternately with a kharíf crop of bájri mixed with various pulses. It is almost invariably sown with occasional rows of safflower in Násik and Ahmadnagar. The irrigated variety of these two districts as of the rest of the Deccan, is also a fine large hard white or yellow called *Bakshi*, identical with the irrigated *bansi* of Khándesh. This wheat is grown as a dry-crop in the elevated plateau of the Párner táluka of Ahmadnagar. It is readily distinguished from the dry-crop hard white or *pivla*—of the Deccan—in the field by its black awns (*kále kusal*) and in the sample by a characteristic glaze. Its quality is very high, but its cultivation is greatly lessened by an undoubtedly great liability to rust. On this account a kindred grain spelt (Maráthi *khapli* or *jod*) is more commonly cultivated in irrigated lands. The grain is narrow, long and pointed. It claims almost complete immunity from rust. It is usually classed as a hard red wheat. The glumes adhere to the grain and it can only be cleaned by pounding. In the Southern Marátha Country the wheat grown

in rotation with cotton is nearly all dry-crop and is all hard red much larger than the kátha of Gujarát bhál lands. Spelt is also cultivated, where irrigation is available.

5. This slight sketch is attempted with some diffidence, for the uncertainty of vernacular names of varieties and the difficulty of securing accurate accounts of characteristics and modes of cultivation, makes it impossible to describe even so well known a crop as wheat with confidence.

6. The variation in yield is considerable as will readily be supposed from the description given above. In a pamphlet called the "Wheat Production and Trade of India" published in 1883 by the Government of India, it was sought to give to the public some information as to the characteristics and yield of various varieties of wheat in various tracts. The question of yield was especially under consideration in this Presidency in the same year when a committee of experts drew up as fully and as accurately as could be done from recorded information and personal experience, formulæ showing variations in yield in the different districts and tálukás of Bombay. In the formulæ the bumper yield of each táluka was entered at 16 annas. The 16-anna yield represented the best crop in the best land, in a good season and under the best system of cultivation known in the táluka. Abnormal and extraordinary yields which experiments had shown to have been now and then secured were, however, excluded. The recorded figures in the formulæ will indicate the variation in outturn:—

No.	District.	Dry-crop wheat.	Irrigated wheat.	Spelt.
		Lbs.	Lbs.	Lbs.
1	Ahmadabad	1,100 to 1,200	1,900 to 2,100	.....
2	Broach	1,200 to 1,300	.....	.....
3	Khándesh	900 to 1,000	1,350	1,800
4	Ahmadnagar...	800 to 1,000	Do.	Do.
5	Násik...	Do.	Do.	Do.
6	Dhárwár	Do.	1,300	Do.

7. As far as the Deccan and Southern Marátha Country are concerned, I am inclined to accept these estimates as fairly trustworthy, but they appear too high altogether for the "bhál" lands of Ahmadabad and Broach. I have collated experimental results obtained since 1878-79 as far as available:—

AHMADABAD EXPERIMENTS.

Unmanured Dry-crop Wheat.

Táluka.	Year.	Yield per Acre.		Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Grain.	Straw.				
		Lbs.	Lbs.	Rs. a. p.			
Dhandhuka	1878-79 ...	379	245	2 12 0	13·1	...	Under average of season.
Do.	Do. ...	454	301	3 0 0	12·5	...	Above do.
Dholka	1882-83 ...	515	533	2 10 8	14·4	12 as.	
Sánand	Do. ...	484	714	0 14 0	4·55	14 as.	Continuous wheat (kátha).
Do.	Do. ...	361	346	1 2 0	13·1	12 as.	
Dholka	1883-84 ...	640	400	1 15 7	7·13	...	
Do.	Do. ...	548	320	1 8 8	7·02	16 as.	
Viramgám	Do. ...	650	880	1 9 3	6·6	...	Good year, wheat alternating with cotton, (Dáudkháni).
Do.	Do. ...	648	753	1 1 4	4·7	...	
Do.	Do. ...	475	520	1 3 7	8·24	...	
Viramgám	1884-85 ...	650	880	1 9 3	6·6	...	Alternating with cotton.
Do.	Do. ...	646	753	1 1 4	4·7	...	Do.
Do.	Do. ...	475	520	1 3 7	8·24	...	Do.
Dhandhuka	1885-86 ...	401	289	1 1 3	11·01	14 as.	Yield decreased by rust.

Irrigated and Manured.

Táluka.	Year.	Yield per Acre.		Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Grain.	Straw.				
		Lbs.	Lbs.	Rs. a. p.			
Dholka	1882-83 ...	1,107	1,066	5 6 4	13·00	12 as.	
Sánand	Do. ...	1,020	800	4 7 9	11·36	12 as.	
Dholka	1883-84 ...	1,512	865	4 13 0	8·66	16 as.	*Kiári* or embanked land.
Dhandhuka	Do. ...	1,230	1,730	0 5 10	·98	16 as.	Temporary well; no water charge.
Do.	Do. ...	1,346	1,986	6 0 0	14·40	16 as.	
Daskroi	1884-85 ...	1,202	1,430	3 3 4	7·88	...	

It seems from these figures that the yield of the Ahmadabad wheats has been over-estimated. It also appears from the fact that the dry-crop varieties are not manured and are grown continuously, that so large a yield as that set down in the formulæ is very improbable.

The experiment for 1885-86 is shown in detail in the Tabular Statement (No. 1). It was made on a large area (30 gunthás) by an experimenter who has had considerable experience. It must be noticed that by the custom of the district 14 annas is taken to represent an average crop and not 12 annas as is generally the custom in the Presidency.

8. *Násik.*—The Násik Experiment (No. 16) shows a yield much above the bumper yield of the formulæ for the táluka, though it is described as an average one only. The extraordinarily low yields reported from this district for the two previous years were fully noticed in my reports. Just as these appeared to demand explanation, so does the very high yield now reported. The season of 1885-86 was in Násik less favourable than 1883-84. The following figures show the results reported from this district:—

Na'sik Experiments.

Dry-crop Wheat.

Táluka.	Year.	Yield.		Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Grain.	Straw.				
		Lbs.	Lbs.	Rs. a. p.			
Dindori	1883-84 ...	550	...	0 11 9	5·10	16 as.	Very good season.
Niphád	Do. ...	385	...	1 14 7	20·80	16 as.	
Do.	1884-85 ...	468	480	1 2 2	11·07	12 as.	Good season.
Do.	Do. ...	465	560	1 2 8	11·35	12 as.	
Dindori	Do. ...	579	560	1 0 0	7·05	14 as.	
Do.	Do. ...	280	306	1 1 0	15·00	8 as.	
Niphád	1885-86 ...	1,167	1,453	1 5 2	4·12	12 as.	Do.

A special order has been given by Government directing a large number of experiments on wheat and other staple crops in this district with a view to reconcile these apparently irreconcileable results.

9. *Khándesh.*—In experiment No. 7 Mr. Hughes reaped a whole field of 13 acres 14 gunthás, and there is no reason to doubt the accuracy of the recorded results which moreover tally generally with the formulæ. Mr. Shridhar Gundo sends in two ordinary experiments on wheat (Nos. 8 and 9) and the results of a test (No. 10) taken in connection with a special experiment which has however been treated as an ordinary one.

10. In the Southern Marátha Country three experiments were made. I personally took two tests in Bijápur. One in the Don valley gave a very large outturn, higher than the 16-anna yield of the formulæ, which for the Bágevádi táluka is 1,200 lbs. Here wheat follows gram and is followed by late (white) jowári in a three-year shift. But occasionally when the rains are early and good, early

(red) jowári is sown with mug and rows of túr. The crop was attacked with rust, but it completely recovered and was not injured in quality or quantity. In the 3 acres 28 gunthás of the field of experiment, 28 gunthás by measurement were so completely overrun with *hariáli* that no attempt was made to sow this portion. The figure for column 9 was therefore found by dividing the total assessment by the area sown. The crop is always mixed with rows of safflower, but the same amount of seed of the principal crop is used whether sown alone or with occasional rows of the subordinate crop. To eliminate the complication arising from the row crop I have divided the area proportionately (*see* No. 23, Tabular Statement). Thus 8 gunthás contained really only 7 gunthás of wheat. The local ser measure contains 153 tolás of wheat or 116 tolás of safflower seed. The straw in this rich jowári tract is only used for thatching. The crop is pulled and the long straw is kept whole for this purpose. I append (*see* Appendix A) an estimate of the cost of cultivation, containing some general information. I took the weight of 4 local sers 3 days after the crop was reaped and kept the wheat for 6 months to ascertain the loss by dryage. This amounted to less than 1 per cent., which is a clear proof that the cultivators reap their wheat dead ripe. The weight per bushel is 64½ lbs.

(2) Sugarcane.

11. Inasmuch as under the authority of Government Resolution No. 2885, dated 15th April 1886, Revenue Department, I have invited special reports on this crop in which the experimental results of various years will be incorporated, I need only briefly review the experiments made in 1885-86. They are shown in the Tabular Statement in detail. Mr. Snow's experiment (No. 17) on cane close to Poona manured with cowdung and sweepings was very carefully made. The yield is very high, more than the 16-anna yield of the formulæ, which is very probable, because the cultivation is certainly more careful than the average cultivation of the táluka. It would be very interesting to have the results of a similar experiment on similar land manured with poudrette. Mr. Woodward's experiment (No. 18) is on a very similar variety of cane, but cultivated in a very different manner. The irrigation is from a stream on the banks of which a rough well or *budki* is made temporarily and the water is raised by the lever and bucket lift worked by hand (4 men). Mr. Lucas' experiment (No. 25) above the ghâts in Kánara shows a very high yield. The figures are hardly credible for the cane was grown with only a flooding of water before planting.

The cost of cultivation as estimated by Mr. Snow bears evidence of accuracy and will be used for the summary under separate preparation as noticed above.

(3) Tobacco.

12. Tobacco was also selected for especial enquiry, the districts chosen being Kaira in Gujarát and Belgaum in the Southern Marátha Country, where tobacco is a specially important crop. The response to the call has been satisfactory. Mr. Kennedy in Kaira who has had great experience with tobacco added two more careful tests to those which he had previously made, while from Belgaum 2 experiments are reported. There is on record a series of reports made in 1873, on the cultivation of tobacco which give very detailed information. These reports are summarized in the volumes of the Gazetteer. I need not repeat what is already available in published records, but would draw attention to the preparation of the seed nursery. This is either manured with sheep dung (brought on to the land and not obtained by folding sheep, as sometimes seed nurseries for rice are prepared in the Konkan) or by burning layers of brushwood and grass very much in the manner in which generally the rice seed-beds are prepared in the Konkan. The virtues of ráb are the subject of much contention at the present time in the Konkan, and in the preparation of the tobacco seed-beds we have instances of what are there styled *kachcha* or unburnt and *pakka* or burnt ráb. I may notice on the authority of Mr. Cabaniss, Assistant Director of Agriculture in Burmah, that in America the tobacco nurseries are similarly rábed but there with logs of wood burnt on the seed-bed. In Nadiád the young seedlings are sometimes top-dressed with castor-oil cake, when owing to excess of rain or other cause the seedlings show signs of distress. This fact is reported by Mr. Behechardás Viháridás Desái, one of the highest authorities on tobacco in Gujarát.

13. I notice from a report by Mr. C. Benson, Assistant Director of Agriculture, Madras, that in the rich tobacco districts of the Krishna and Godávari deltas the seed-bed is prepared by *folding* sheep. The point is worthy of the attention of Nadiád cultivators. This folding of sheep is practised in the Southern Marátha Country also. The compilation of 1873 shows that the tobacco in Belgaum is also raised from seedlings reared in a nursery. But in neither of the experiments now reported is a description of the preparation of the seed-bed given, the seedlings in both cases having been purchased. It may be taken that seedlings are always raised in a nursery though in the compilation of 1873 it is stated that in places the seed is sown broadcast. The context shows that this sowing refers to the seed-bed, where of course the seeds are sown broadcast.

14. Tobacco is grown continuously in some parts especially in Kaira and in Sind, whence it is reported that the produce from continuous tobacco is highly prized. In Belgaum it is grown in rotation once in 3 years. It is grown both with and without irrigation, though in either case the seed-bed requires a sprinkling of water, when the rain holds off. Tobacco is always manured. Goat dung seems to be specially valued for its cultivation. The principal object appears to be quantity, rather than quality.

15. As regards yield Mr. Behechardás Desái considers that the average produce of the "Charotar"—a rich alluvial tract of Nadiád, the head-quarters of tobacco cultivation in Gujarát, is about 1,600 pounds per acre of tobacco cured for the local market. The compilation of 1873 gives the produce at 1,200 pounds. The formulæ estimate the 16-anna crop at 4,400 pounds, or if the 12 anna-entry of the formulæ be taken to represent an average crop, 3,300 pounds on the average. In none of these estimates is a separate estimate given for dry and irrigated tobacco and in the formulæ it is not stated whether the estimate is for cured tobacco or tobacco fresh cut.

16. As regards Belgaum, the yield in the compilation is recorded as 280 lbs. per acre, though it is noted that in Chikodi, the best tobacco tract, it reaches 420 lbs. per acre in a first rate season. The formulæ give the 16-anna estimate at 3,000 lbs. for the Chikodi and Gokák tálukás.

17. I shall now show the results of experiments made since 1881-82 :—

KAIRA EXPERIMENTS.

Tobacco.

Táluka.	Year.	Yield.	Value.	Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Lbs.	Rs. a. p.	Rs. a. p.			
Borsad	1881-82	1,577	160 0 0	12 4 0	7·6		Irrigated.
Nadiád	1884-85	1,435	143 0 0	5 6 9	3·77		Irrigated from a well outside the field, no water-rate in column 5.
Nadiád	1885-86	1,928	205 0 0	10 5 6	5·02		Continuous tobacco. Irrigated.
Borsad	Do.	2,119	142 0 0	8 2 3	5·73		Do. do. do.

N.B.—The weight of the fresh cut tobacco in these last two experiments was 7,230 lbs. and 8,530 lbs. respectively, from which it is clear that the estimate of the formulæ is for *cured tobacco.*

BELGAUM EXPERIMENTS.

Tobacco.

Chikodi	1884-85	799½	...	...	.....	12 as.	*See* Crop Experiment Report, 1884-85, p. 71.
Do.	1885-86	315	30 3 6	1 6 5	4·63	16 as.	Tobacco. Dry-crop, last grown on this land 10 years ago. Black soil.
Gokák	Do.	1,087	92 5 6	2 3 8	2·4	10 as.	Dry-crop. Black soil, yearly receiving silt deposit from flooding of the Ghatprabha.

The weights are for cured tobacco. Mr. Price, one of the framers of the formulæ, as noticed last year desires to amend the entry for tobacco by the substitution of 1,000 lbs. for 3,000 lbs. for a 16-anna crop. The experiments are certainly in favour of some modification.

18. I have not noticed the diseases of tobacco. One, a parasite feeding on the roots of all Solanaceæ and not on tobacco only—is called in Gujarát

"*Vakumba*" and in the Southern Marátha Country and Deccan "*bambaku.*" In places this parasite—which is a broom rape (Orobanche) prevents successful growth of tobacco except at long intervals. I saw a crop in the Bijápur district, so poor as not to pay the cutting, on land which had not grown tobacco for 7 years. There were more plants of the parasite than of tobacco. The owner said he had been rash in taking tobacco so soon again. In the face of these facts, it is curious that in Gujarát and Sind tobacco can be grown continuously for the parasite is well known.

(4) Linseed.

19. The last crop selected for special enquiry was linseed. It is in this country grown as an oil-seed and never for flax. It is a most delicate crop, suffering from various diseases, of which a fungoid disease probably rust is the most common. Even where the attack is slight and in appearance the crop has not suffered, it is found that the capsules are only partly filled and the yield is thus often reduced by half without apparent injury. It is sown alone in Khándesh, but in the Deccan and Southern Marátha Country chiefly as a row crop with wheat or gram and round the headlands. The framers of the formulæ credit the crop with a maximum yield of 500 lbs. in every táluka in which it is grown. In Khándesh it is sometimes taken as a late crop following bájri of the same season. Linseed has seldom been selected by experimenters and little is therefore on record as to its varying yield. In the season under report it was almost a complete failure in the Deccan and Southern Marátha Country from prevalence of the fungoid disease noticed above. An experiment was made in Dhárwár by Mr. H. R. Shirhatti which gave a yield on very poor soil (assessed at 14 annas 9 pies per acre full of limestone nodules and very shallow) of lbs. 33 per acre. It was here grown as a row crop. Jowári was sown with the 4-coulter drill and on every fourth row alternately gram and linseed were deposited on the sown jowári by the seed tube. The yield of 33 lbs. on every eighth row represents a yield of $9 \times 33 = 297$ lbs. on the acre of linseed. It will be interesting if this crop could be selected specially again this year, care being taken to note whether (1) it is the sole crop of the year, or (2) the second crop after an early crop, or (3) a row crop. In the last case the number of rows of linseed and of the principal crop sown with it should be noticed.

B.—Experiments on other Crops.

20. *Northern Division.*—In Ahmadabad Mr. Maconochie made three ordinary experiments which are shown (Nos. 2, 3 and 4) in the Tabular Statement. The preparation of the seed nursery for rice is not described nor its proportion per acre of rice.

The estimate for the fodder jowári (2 annas) is very low. The formulæ estimate 300 lbs. as the maximum grain yield of this variety. Apparently a confusion has arisen between the fodder jowári and that grown for grain. This is further presumable from the rate of seeding. As much as 70 lbs. per acre are sown for the *sundio*. The barley crop was very poor.

21. *Central Division.*—Besides the experiments on selected crops a few were made as shown on other crops. One on bájri by Mr. Shridhar Gundo and one on groundnut by Mr. L. G. Deshmukh have been rejected because the test area was below the prescribed minimum.

22. *Southern Division.*—Two experiments by Mr. Sorábji Padamji have been rejected on account of numerous discrepancies, which have been pointed out to that officer by the Collector and myself.

Mr. Shirhatti submitted two experiments besides the one reported (No. 22). One was on linseed. Though after-enquiry showed that the linseed was sown only on every 8th row of jowári which was the chief crop, no mention of the jowári was made. The other was on rice. I have not succeeded in obtaining the figure for column 9. Both experiments are excluded.

Mr. Charles submits a very careful special experiment which I have thought advisable to show in a summarized form. *See* Appendix B. The figures are shown in the Tabular Statement (No. 21).

TABULAR SUMMARIES.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	AHMADABAD.								
	Mr. Edalji Dosábhái, District Deputy Collector.							Original survey	
1	Dhandhuka (Sodhi) ...	Dry-crop wheat Chásia (Kátha) hard red.	14 as.	50	401 grain.	289 straw.	9 12 8	1 1 3	11·01
	Mr. A. F. Maconochie, Assistant Collector.								
2	Sánand (Sánand) ...	Rice (Sutarsál).	10	...	1,670 paddy.	2,650 straw.	36 9 0	3 9 0	9·74
3	Do. do. ...	Jowári (Sundio).	2	30	182 grain.	2,155 straw.	24 6 0	1 6 9	5·83
4	Do. (Bhat)	Irrigated Barley.	Poor ...	65	885 grain.	818 straw.	18 12 0	1 14 5	10·15
	KAIRA.								
	Mr. R. M. Kennedy, Assistant Collector.								
5	Nadiád (Chakalási) ...	Tobacco (irrigated).	12	...	1,928 cured leaf.	...	205 6 0	10 5 6 including water-rates.	5·02
6	Borsad (Nápa)	Do. ...	10	...	2,119 do.	...	142 1 4	8 2 3 including water charges.	5·73

Northern Division, 1885-86.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 30	Weight *ser* =40 tolás.	Unmanured black soil (bhál), growing wheat or cotton. Manure seldom, if ever, used. Season favourable but for cloudy weather at ripening time which diminished the yield. Land clean. Twice hand weeded. An average crop estimated locally at 14 annas.
0 8	Do. ...	Continuous rice, irrigated from a tank, in embanked land (kiári), grown from seedlings reared in a seed-bed. Manured in alternate years. Season not very favourable, as rain insufficient.
0 8	Do. ...	Jowári grown for fodder alternating with kodra. The kodra of the previous year was manured. This jowári is sown as an early rain crop. Soil black. Estimate of column 4 incorrect.
0 8	Do. ...	The land is gorádu, growing crops of wheat and barley alternately. The irrigation is from a well in an adjoining number on which Rs. 7 per bucket or *kos* is charged over and above the assessment giving Rs. 2-5-0 per acre. Crop much damaged by white ants.
0 6	Do. ...	Tobacco irrigated from a well close by. Soil, gorádu. Rotation, continuous tobacco grown from seedlings raised in a seed-bed of ½ guntha for 29 gunthás, manured with one cart-load of sheep's manure and watered when rain held off. The nursery was planted in the first rains and the seedlings transplanted about the beginning of September. Manured at the rate of 21 cart-loads per acre in June. Cultivation average (good) and crop good though tobacco in the neighbouring places suffered from frost. The curing consisted in leaving the leaves spread out on the ground for 10 days, and then at night sprinkling with water. They were then weighed and packed for sale.
0 6	Do. ...	Tobacco grown on a similar kind of soil, irrigated from a well close by. Manured in June at 50 cart-loads per acre. Rotation, continuous tobacco grown from seedlings raised in a seed-bed of the same size and with the same treatment as No. 5, and the crop though slightly affected by frost was fair but the cultivation was inferior to that in No. 5 though the soil superior, the labour being hired; the tobacco, though at first appearing to have a finer and more luxuriant leaf, lost rapidly in weight during curing and was declared inferior.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Per centage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	KHA'NDESH.								
	Mr. H. A. Hughes, Assistant Collector.							Original survey	
7	Chopda (Chopda)... ...	Dry-crop wheat, hard red.	16	63	716 grain.	1,045 straw.	20 13 6	1 13 11	8·98
	Mr. Shridhar Gundo, District Deputy Collector.								
8	Amalner (Amalner) ...	Do. 'bansi', hard white.	16	54	1,217 grain.	1,344 straw.	30 1 4	1 7 10	4·95
9	Do. do. ...	Do. ...	16	54	731 grain.	800 straw.	18 2 8	1 14 1	10·36
10	Do. do. ...	Do. 'kátha', hard red.	16	54	843 grain.	900 straw.	20 0 0	1 15 6	9·85
11	Do. (Amalgaon) ...	Linseed ...	10	17½	308 seed.	...	14 4 0	2 0 0	14·03
12	Do. do. ...	Do. ...	10	17½	345 seed.	...	15 12 0	2 0 7	12·93
	Mr. Leslie Moore, Assistant Collector.								
13	Jalgaon (Jalgaon) ...	Do. ...	8	15	449 seed.	...	21 1 4	1 13 4	8·70
14	Bhusával (Chinchkhed Budruk, Peta Edalabad).	Jowári 'Ananeri.'	14	12	896 grain.	600 straw.	22 0 0	1 1 9	5·04
	Mr. H. E. Winter, Assistant Collector.								
15	Pimpalner (Jaithan in Nizámpur Peta).	Bájri 'Surla'.	Not stated.	8·45	420 grain.	1,030 straw.	12 10 6	0 11 9	5·80
	NA'SIK.								
	Mr. V. B. Vádekar, District Deputy Collector.								
16	Niphád (Ugaon)	Dry-crop wheat (Pivla) hard yellow.	12	35	1,167 grain.	1,453 straw.	32 1 4	1 5 2	4·12
	POONA.								
	Mr. P. C. H. Snow, Assistant Collector.								
17	Haveli (Ghorpadi) ...	Sugarcane 'Punda.'	14	15,000 sets.	7,975 'Gul'.	19,000 tops and leaves.	484 14 4	1 15 4 assessment and 25 0 0 water-rates	5·56
								26 15 4	

Central Division, 1885-86.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
13 14	140	Manured black soil, growing wheat in rotation with cotton, jowári and bájri. In this district jowári and bájri are kharíf crops. Season favourable; an average crop is locally called 16 annas.
0 10	142	Manured black soil, growing crops similar to those on land of last experiment. Good season and first rate black soil. The manure for the wheat was 18 cart-loads per acre.
0 10	142	Similar soil and close by, but unmanured for wheat. The experimenter attributes the difference in yield to the absence of manure in this case.
0 8	142	Unmanured first rate black soil, similar to that of the experiments Nos. 8 and 9.
0 10	121	Good black soil unmanured. Rotation 1 wheat, 2 jowári (kharíf), 3 linseed. Crop injured by rust.
0 10	121	Do. do. do.
0 10	120	Medium black soil. Manured.
0 10	142½	Soil partly black and partly brown (bardi). Manured 10 loads per acre. Season favourable to the crop. The straw appears very low. The figures are doubtful. The weight of the ser was reported at 70 tolás but a test made at the Khándesh Farm shows it to be double.
0 8	142½	Light soil (bardi), growing cotton when early rain favourable, otherwise bájri with a mixture of pulses (matb, hulga) and a sprinkling of ambádi. Early rains unfavourable and crop not sown till 1st September and later rain not sufficient. Field weedy, land manured 2 years before at the rate of about 20 loads per acre. Column 10 calculated on yield of bájri alone.
0 6	120	Unmanured black soil, growing wheat as a late crop and bájri mixed with pulses as an early crop in alternate years. Season favourable, though slight rust. Locally an average crop is called a 12-anna crop.
0 8	Weight *ser* =80 tolás.	Reddish soil. Heavily manured 160 cart-loads of farm yard manure per acre, costing Rs. 200. White large variety (Punda). Cane taken alternately with gram or groundnuts. Watered from canal, water-rate Rs. 25 per acre. Number of canes per acre 22,685 from 15,000 sets or cuttings (tipris) planted. Gul 16 per cent. of weight of juice. Weight of canes not given. Cost of cultivation by hired labour Rs. 368. Fuel, the trash of the cane only.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	BELGAUM.								
	Mr. H. Woodward, Assistant Collector.							Revision survey	
18	Sampgaon (Nágnur) ...	Sugarcane 'Bile rasaváli kabbu.'	14	5,000 sets.	3,620 'Gul.'	24,000 tops and leaves for fodder.	201 7 4	7 0 0	3·47
	Mr. Sorábji Padámji, Assistant Collector.								
19	Chikodi (Hukeri).... ...	Tobacco unirrigated.	16	...	315 cured leaves.	...	30 3 6	1 6 5	4·63
	Mr. Gursidápa Virbasápa, District Deputy Collector.								
20	Gokák (Konnur)	Do. ...	10	4,410 seedlings.	1,087 do.	...	92 5 6	2 3 8	2·40
	DHA'RWA'R.								
	Mr. F. L. Charles, Assistant Collector.								
21	Kalghatgi (Bendigeri) ..	Rice 'Somsáli.'	4 to 5	47	495 paddy.	1,828 straw.	12 6 0	1 12 8	14·45
	Mr. H. R. Shirhatti, District Deputy Collector.								
22	Navalgund (Annigeri) ...	Dry-crop wheat, hard red.	8	22 lbs. wheat and 1½ lbs. safflower.	395 grain.	473 straw.	9 9 8	1 13 4	19·08

Southern Division, 1885-86.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 5	...	Good black soil on the bank of stream whence irrigable by paikotta classed as garden (pátasthal). Cane taken in alternate years. Cultivation very clean and careful. Sheep folded on land and besides farm yard manure applied. Cost of cultivation estimated at Rs. 128 and net profit at Rs. 80 per acre.
6 38	Weight *ser* =20 tolás.	Good black soil, manured, growing cotton and chillies in rotation and a crop of tobacco about once in 10 years. Area not measured but whole jiráyat portion of field tested which is recorded at 6 acres 38 gunthás in the Survey Register.
0 8	Do.	Good black soil, unmanured, but yearly enriched by silt deposit from the Ghatprabha. Usual crops jowári and gram. Seedlings of tobacco purchased.
0 10	110	Somsáli, a medium quality of rice drilled with the 4-coulter drill on 29th April 1884. Grown continuously on land manured in alternate years. Not manured in the year of test. Soil mixed red and white (masabu). Field weedy on account of absence of the rolling of the standing crop (hodata) which was prevented by insufficient rain. The rain was especially deficient in the latter half of the monsoon. Proportion of straw very high in comparison with grain, also due to omission of the hodata (*see* also Appendix B).
3 27	148	Wheat with rows of safflower. Column 10 is calculated on the wheat alone. Soil deep black. Unmanured for several years. It grows cotton, wheat, and jowári in rotation.

Summary of the Crop Experiment Reports,

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
	BIJA'PUR.			Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. E. C. Ozanne, Director of Agriculture.								
23	Bágevádi (Sátihál) ...	Dry-crop wheat, hard red.	14	38	1,503 grain.	2,366 straw.	29 8 0	Revision survey 1 10 8	5·65
24	Sindgi (Hipargi)	Do. ...	12	30	731 grain.	708 straw.	14 12 0	1 0 0	6·78
	KA'NARA.								
	Mr. A. Lucas, Assistant Collector.								
25	Supa (Havgi)	Sugarcane (Rasadáli).	13	25,000 sets.	6,343 'Gul'.	...	365 15 7	3 5 0	·90

Southern Division, 1885-86—continued.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 8	153	Wheat with safflower in every 8th row. Area therefore divisible into 7 parts wheat and 1 safflower. Column 10 calculated on the wheat alone. The crop failed in the previous year and this accounts for the very high yield which was practically after a bare fallow. Land seldom manured but it is rich black soil of the Don valley. The crop was excellent but not the best in the village, and by the village standard was 14 annas, for the season. But this figure would probably be a bumper crop for the tálnka. Column 7 is made up of 1,583 lbs. of long straw and 783 lbs. of chaff. The figure in column 11 includes 7 gunthás of wheat and 1 of safflower.
0 6	150	*See* Appendix A.
0 6	Weight *ser* =20 tolás.	Sandy soil. Manured. 12 months' crop. Figures doubtful.

APPENDIX A.

Ordinary Crop Experiment at Hipargi, Táluka Sindgi, Bijápur District.

Soil.—Medium black—capable of growing both early and late crops but more suited to the latter. Cotton is the chief crop of this kind of land. It is sown in September and is, if possible, grown once in three years. In other years wheat or early jowári or gram is sown.

Cultivation.

The black soil is ploughed and cross ploughed with the 8-bullock plough once in about 10 years. The plough is followed by the heavy harrow, also drawn by 8 bullocks. The object is to clear the land from deep-rooted grasses (*kunda* and *hariáli*). These however are more thoroughly kept down by hand digging. After the field has been hand dug and picked the grasses are kept down for about 5 years. The heavy ploughing and harrowing keep it fairly clean for about the same number of years, and then hand digging must again be done. This digging is sometimes done by contract at the rate of Rs. 3 per bigha for hariáli and Rs. 4 for kunda. The bigha is $\frac{1}{3}$rd of an acre. The land measure in use is the kurgi, *i.e.*, that area which can be sown by the 3 or 4-coulter drill in one day. The kurgi is larger therefore where the 4-coulter drill is used. At Hipargi it clearly very closely approximates 3 acres. 9 bighás=1 *kurgi*. The contract rate for the hand digging comes to Rs. 9 to 12 per acre. The Bijápur Gazetteer estimates the cost at Rs. 30 per acre. It may reach that sum where land has been long neglected. Poor rayats hand dig at leisure small patches of land year by year.

The deep ploughing is done at the rate of an acre in about 3 days and the after-harrowing takes as long. Taking the cost for 2 men and 8 bullocks at 12 annas a day :—

Cost.		Per acre.
Ploughing and cross ploughing...	Rs.	4 8 0
Harrowing	,,	2 4 0
	Rs.	6 12 0

Labour is cheap and so the feed of cattle, usually, in this locality and considering local circumstances the charge fairly represents the actual cost to the rayat.

It is not an over-estimate to take Rs. 2 an acre a year as the cost of these periodical cleanings—a proof of the seriousness of the conflict which is waged in black soil against the arch enemies to good cultivation—kunda and hariáli. In addition a yearly harrowing is necessary before sowing. For wheat the land is harrowed sometimes as much as 7 times. For early jowári 2 or 3 suffice. No rule can be laid down. The light harrow is drawn by 2 bullocks and works an acre and a half a day.

For wheat the seven harrowings would thus cost about Rs. 1-5-0 at 3 annas an acre for each.

Sowing.—The drill (kurgi) is drawn by 2 bullocks and the seed is sown by the driver. The usual row crop of safflower with wheat is sown by another man who holds the seed tube (*yelsaddi*). A pair of light seed harrows (1 man and a pair of bullocks) cover up the sown seed. As stated above 3 acres are sown in a day.

Seed.—Wheat 24 sers (1 ser=150 tolás) and safflower 2 sers (1 ser=116 tolás) are sown per kurgi. The safflower is deposited on the outer furrow made by the drill. Rate per acre 30 lbs. wheat and 2 lbs. safflower.

Reaping.—The cost is usually calculated as equivalent to the cost of seed. Where labour is cheap this appears fair, and approximates the cost where the reaping is paid in kind at so many sheaves per hundred.

Threshing—This depends on the crop. The cost may be taken at 2 annas per Imperial maund (82 lbs.).

Winnowing.—Three men it is asserted will with a good breeze winnow 9 maunds a day. Wages are perhaps a little higher as the monsoon is drawing near and the cost may be put down at 9 annas or 1 anna per Imperial maund.

Wheat is not weeded or hoed or watched. Carting the crop home is so variable a charge that it is hard to assign a valuation.

Abstract for Crop experimented on.

		Per acre.		
Annual charge for cleaning land	Rs.	2	0	0
Harrowing the land for wheat	„	1	5	0
Sowing and covering	„	0	5	0
Seed wheat 30 lbs., safflower 2 lbs.	„	0	9	0
Reaping	„	0	9	0
	Rs.	4	12	0
Add—				
Threshing and winnowing at 4 annas per Imperial maund...	Rs.	1	12	0
and, carting according to distance from village ...	„	0	4	0
About ½ ton of wheat in straw will be a cart-load. Total ...	Rs.	6	12	0

APPENDIX B.

Mr. Charles has sent an experiment on a holding of 9½ acres, of which 7 acres are continuously cultivated with medium varieties of rice and the rest apparently kept under grass.

Details.

A.	g.	
3	20	Somsáli rice, experimented on.
3	20	Hakalsáli.
2	20	Grass and pot kharáb (3 gunthás.)
9	20	Assessed at Rs. 17 or

Rs. 1-12-10 per acre. The maximum rice assessment for the village fixed at the revision survey is Rs. 8. The average assessment is Rs. 2. The field of experiment is thus a little below the average.

The holding is well chosen. It is cultivated by a rayat and his wife (with only married daughters residing with their husbands). The rayat has a harvest cart and 4 bullocks but no other cattle. He subsists solely on the produce of his field. He was in debt but is now clear.

The yield of *somsáli* rice was 180 sers per acre. That of *hakalsáli* which succeeds better in a year of insufficient rainfall, was in appearance better. The straw and the grass of the portion kept for grass go towards the feed of cattle, and sufficed for that purpose in the year of the experiment.

The gross produce of the holding may be taken at 1,260 sers of paddy.

Before considering the cash and grain deductions the cultivation must be described. The land is ploughed with the large 4-bullock plough (*ranti*) as soon as the crop is removed. In the hot season it is harrowed with the 4-bullock harrow (*harago kunti*) and then on the first rainfall again ploughed. The seed at the rate of 17 sers (=47 lbs.) is drilled with the 4-coulter drill (kurgi) drawn by one pair of oxen at the end of April and seed covered with the *háláki* or seed harrow. When the crop is about 4 inches high it is bullock-hoed 4 times or oftener with the *yedi kunti*, between the rows to kill weeds. The rows are hand-weeded by hired labourers 10 or 20 at a time. It is estimated that the labour thus employed was equivalent to 100 men at 1 anna 9 pies a piece—working according to custom from noon to night. The late coarse grass on the headlands and embankments was cut by hired hands at an agreed cost of 40 sers of paddy. One very important operation was omitted, *viz.*, the mud-rolling (*hodata*). This consists in rolling the standing crop with a broad bar of wood hollowed on the lower side in the direction of its length, before the stems have hardened, while the field is full of water. Its object is two-fold. It checks the natural tendency of the crop to excessive growth of straw at the expense of the grain yield and thus corresponds to the transplantation of seedlings raised in a nursery, and it also keeps down weeds which have grown up since the bullock-hoeing and hand-weeding. The hodata cannot be done unless the rain is sufficient to flood the field with impounded water. In the case in point it was unavoidably omitted, with the natural result of a low proportion of grain to straw, or more correctly speaking a high yield of straw in proportion to grain.

This description of 'hodata' is taken partly from Mr. Charles' report and partly from independent enquiries made by myself. Mr. Charles justly values the operation but gives it credit only as a weed destroyer. He says "It is pulled over the rice and weeds when the field is deep in water. The weeds are pressed down and do not again rise or die under the water while the rice springs up and thrives." As to this it must not be forgotten that the weeds have before this stage already been twice weakened by the bullock-hoeing and the hand-weeding, and these facts only account for the superior power of recovery of the rice.

The rice crop is manured in alternate years. But though it is not so stated it is probable that some portion of the land of the experiment is yearly manured. The somsáli area was not manured this year and so probably the hakalsáli area was and this may partly account for its superior crop.

The cost of reaping, carrying and threshing is estimated at the cost of 240 sers of paddy. Details are not given.

In estimating the cost of home-labour Mr. Charles rightly does not deduct the amount of clean rice at 1½lbs. per day per adult, on the fair argument that with paddy selling at 16 sers per rupee the rayat would sell his rice and buy jowári and náchni at 60—80lbs. per rupee. The material is now obtained for grain and cash deductions from the gross outturn:—

	Rs.	a.	p.
Gross produce 1,260 sers at 16 sers per rupee ...	78	12	0
Hired labour for ploughing (40), harrowing (20), sowing (20), cutting grass (40) or in all 120 sers at 24 sers per rupee.	5	0	0
130 sers seed at 24 sers per rupee...	5	6	8
Reaping and stacking 240 sers at 16 sers per rupee ...	15	0	0
Baluta—Mhárs 80 sers, Blacksmith and Carpenter 8 sers each = 96 sers at 16 sers per rupee	6	0	0
Cash payments for weeding, 100 men at 1 anna 9 pies each.	10	15	0
Value of grain consumed at home at 3 lbs. a day at 60 lbs. per rupee	18	0	0
Local Funds	1	1	0
	61	6	8
Balance ...	17	5	4

This balance is not sufficient to pay the assessment Rs. 17 and charges on account of clothing, charity (Baluta to Pujári, Gurav, &c.,) and interest on capital laid out in purchase of live and dead stock. But the season was unfavourable and the outturn if anything under-estimated because the hakalsáli was the better crop.

Some interesting details as to the various products of somsáli rice are given. 2 sers of paddy (bhatta) weighed 5 lbs. 9 oz.

By grinding the products were:—

	Lbs.	oz.	Per cent.	Mr. Muir's last year.
Akki or clean whole rice	3	0¾ or	54·8	59·09
Nuchu (broken rice)	0	9¾ or	10·9	11·59
Tanadu (bran)	0	12	13·5	8·75
Kobattu (husk)	0	14½	16·3	20·57
Loss	0	4	4·5	...
	5	9	100·00	100·00

Remarks of the Divisional Commissioners.

No. 3518 of 1886.

Revenue Department.

Camp Nadiád, 22nd November 1886.

I cannot see the necessity for the proposal in paragraph 3. It would surely be sufficient for the Collector to report carefully the number of tolás in the local ser, or (still better) to eliminate the ser altogether and use *pounds* only.

2. In these experiments, the ser, which in this Division is taken at one uniform measure = 40 tolás, represents in different localities in the other two Divisions, the following weights, *viz.*, 20 tolás, 80, 110, 120, 121, 140, 142, 142½, 148, 150 and 153 tolás! It is scarcely credible that a single measure should vary so much, and the fact affords strong evidence of the necessity for the substitution of an uniform standard.

3. The procedure recommended in the Director's paragraph 4 will be not unlikely to cause confusion. The *second* comparison ought not to be necessary if a fairly representative field is selected with an ordinary, average, 12-anna crop. In fact the usefulness of an experiment depends upon such condition being fulfilled. By the selection of a crop greatly over or under the average, the results may be misleading and not improbably *mischievous*.

4. Mr. Ozanne's remarks on the formulæ for wheat in Ahmedabad and for tobacco in Kaira might perhaps be communicated to the Survey Commissioner. I would not attach too much value to the single experiment in Dhandhuka, but I am inclined to think that as regards Kaira tobacco some modification is desirable. In Nadiád (the best tobacco-producing táluka) from 70 to 75 Bengal maunds is considered an average (12-anna) crop, producing from 1,500 to 2,000 lbs. of cured leaf.

5. I cannot but regard the experiment alluded to in Appendix B. as an unfortunate one, illustrative of my remarks in paragraph 3 above. The rayat's condition is exceptionally favourable. He is not in debt, and has no young family to feed. He sells every maund of his rice, and lives only on coarse grain, apparently without salt or condiments. He spends nothing on tobacco or other small luxuries, and yet the result of his year's labour "is not sufficient to pay the assessment, and charges for clothing and charity," much less to cover interest on his capital!

6. The crop conditions must have been something more than "unfavourable," and I think it is to be regretted that a more representative case was not selected.

G. F. SHEPPARD,
Commissioner, N. D.

No. 3461 OF 1886.

REVENUE DEPARTMENT.

FROM

W. H. PROPERT, ESQ.,
Commissioner, S. D.;

To

T. D. MACKENZIE, ESQ.,
Acting Chief Secretary to Government.

Poona, 22nd November 1886.

SIR,

I have the honour to state that I have no remarks to offer on the printed report on the Crop Experiments made in this Presidency during the year 1885-86 forwarded to me by the Director of Agriculture with his memorandum No. 2475, dated 4th instant.

I have the honour to be,
Sir,
Your most obedient Servant,
W. H. PROPERT,
Commissioner, S. D.

No. $\frac{R.}{5348}$ OF 1886.

FROM

ARTHUR CRAWFORD, ESQ.,
Commissioner, C. D.;

To

THE SECRETARY TO GOVERNMENT,
Revenue Department.

Poona, 30th November 1886.

SIR,

I have received from the Director of Agriculture a copy of his report on Crop Experiments for 1885-86, and beg to offer the following remarks on it.

2. The number of experiments conducted during 1885-86 was small in consequence of the reduction of expenditure ordered in Government Resolution No. 4466, dated 3rd June 1885, the experiments being confined to selected crops

in the Khándesh, Násik and Poona Districts of this Division. The crops experimented upon were chiefly wheat, linseed and sugarcane.

3. In Khándesh one important experiment with wheat was carried out by Mr. H. A. Hughes, Assistant Collector, with satisfactory results. Three others were conducted by Mr. Shridhar Gundo, District Deputy Collector. A similar experiment was made in the Násik District by the District Deputy Collector, Mr. Vádekar, at Ugaon in the Niphád Táluka, the yield reported being very high.

4. Mr. P. C. H. Snow, Assistant Collector, conducted an experiment in the Poona District on cane of the large white variety at Ghorpadi in the Haveli Táluka with extremely good results.

5. Linseed was selected for inquiry in Khándesh and three experiments are reported on it. Besides the experiments on selected crops, one on bájri at Jaithan in the Nizámpur Petha of Khándesh District by Mr. Shridhar Gundo and another on groundnut at Chinchkhed in the Edalabad Petha by Mr. L. G. Deshmukh were rejected, the test area having been below the prescribed minimum.

6. Mr. Ozanne's suggestions in paragraph 4 of his letter regarding the entry of the local estimate of the crop in annas in column 12 of the Standard Form should, undoubtedly, be adopted in order to secure accuracy and uniformity.

I have the honour to be,
Sir,
Your most obedient Servant,
ARTHUR CRAWFORD,
Commissioner, C. D.

No. 1382 OF 1887.

REVENUE DEPARTMENT.

Bombay Castle, 4th March 1887.

FROM
T. D. MACKENZIE, ESQ., C. S.,
Acting Secretary to Government;

To
J. A. BAINES, ESQ.,
Acting Director of Agriculture,
Bombay.

SIR,

Adverting to the analysis of crop experiments for 1885-86 forwarded to Government with Mr. Ozanne's letter No. 2422, dated 29th October last, I am desired by His Excellency the Governor in Council to communicate to you the following remarks regarding Appendix B., page 20, and to request you to be good enough to favour Government with your opinion as to the amendment of the rules regarding crop experiments.

2. It will be seen from the report of the experiment alluded to that Mr. Charles has charged one year's consumption of grain, 3 lbs. a day, in his estimate of the cost of home labour of the rayat and his wife who cultivated the holding. It appears to Government to be doubtful whether this item should be included in what should be a valuation on proper economic principles as

stated at the end of Rule 10 of the Standing Orders. The "value of the labour" of the man and his wife, *i.e.* 'wages' is more than a bare food allowance of grain *for the days that they gave labour*, but it may or may not be equal to 3 lbs. of grain for 365 days. For a man and his family to "subsist solely upon the produce" of his holding, it must of course give them much more than this, and it does not seem wise to take out a certain weight of grain as a deduction on account of food to the family, when other necessaries are not charged as deductions. There might be some object in making this deduction if the grain itself were consumed by the family, but there appears to be none where, as in this case, it is converted into money for the purchase of a cheaper food.

3. The result of the estimate on this experiment would, His Excellency is of opinion, be better shown if this item were omitted from the "deductions," and the surplus left—after charging necessary expenses in grain, in cash, and the assessment—were given to meet wages and profits, if any.

4. As a matter of fact a $4\frac{1}{2}$ anna crop in a seventeen rupees holding could not be expected to keep a man and his wife and four bullocks for 365 days, and probably did not *employ* them more than half that time; but it is plain that an *average* crop would give them a profit.

5. The fallacy is so common both in Ireland and in India that an agriculturist and his family must be provided for *a year* by his "land," whether it employs him 100 or 300 days, that it is desirable to remove this item from the estimates as calculated to give countenance to this fallacy.

6. It seems to Government that the subsistence of the agriculturist is a special question which should not be mixed up with these statistics, of which the main object is to show the incidence of the assessment. This, however, can only be done if the experiments are conducted—

(*a*) on the same land,

(*b*) over a series of years,

(*c*) after deducting the two worst and the two best years,

(*d*) stating the annual produce in rupees, and not as in paragraph 4 of Mr. Ozanne's letter,

(*e*) selecting neither the best nor the worst fields, or

(*f*) the best or the worst cultivators.

Government are not convinced that these crop experiments may not be misleading. If they are purely departmental, and if they deal with definite figures and not with varying local estimates of bumper and average crops, some day trustworthy conclusions may be drawn from them. It appears to Government that the experimenters should only collect *facts*, and the deductions from these *facts* should be drawn with great circumspection by the Agricultural Department.

I have the honour to be,
Sir,
Your most obedient Servant,

T. D. MACKENZIE,
Acting Secretary to Government.

No. 953 OF 1887.

FROM

E. C. OZANNE, ESQ.,

Director of Agriculture,

Bombay;

To

THE SECRETARY TO GOVERNMENT,

Revenue Department,

Bombay.

Poona, 8th June 1887.

SIR,

I have the honour to submit the report called for in Government letter No. 1382, dated 4th March 1887.

2. The point at issue is, whether in a *special* experiment as defined in the Standing Orders on crop experiments, the cost of cultivation should be debited with the charge prescribed by the Standing Orders for the value of the labour of the occupant of the selected holding and his family.

3. If the selected holding fulfils the conditions prescribed in Section 3 of the Standing Orders, *i. e.*, if it is one which occupies fully the time and labour of the holder and his family, it seems fair to charge the bare subsistence rates for the *whole year* as part of the cost of cultivation. As pointed out by Government, wages are more than a bare food allowance of grain for the days of labour. I agree with this, and would urge that the bare food allowance for the whole year is as fair an estimate of the wages of the occupant and his family for the actual days of work as could be devised. I do not think that the fallacy indicated—*viz.*, that a rayat must be provided by his land for the *whole* year, whether it employs him 100 or 300 days—enters necessarily into the computation prescribed for the guidance of experimenters. The words "occupies fully" in the Standing Orders clearly mean "occupies the cultivating season", *i.e.*, the time for preparing the land, sowing the crops, watching and weeding, harvesting and preparing for the market. However fully the rayat's time is employed, there must be slack times, when he must be kept by his land, even though he is not actually employed in field or other work in connection with his land.

4. The typical holding is not easy to find, and it is not intended that experimenters should always select one exactly fulfilling the conditions of such a holding. But if the information collected is as full as it should be, it is not impossible for the experimenter or for me, whose duty it is to analyse experiments, to make due allowances and modifications.

5. With reference to the last paragraph of the letter under reply, I would urge that the agriculturist's subsistence is not mixed up with the statistics designed to show the incidence of the assessment, but the incidence of the assessment on *nett* produce cannot be arrived at until the cost of cultivation has been deducted, and this cost must include a fair charge for home labour.

6. It is necessary to explain that the grain deduction is *usually* made on the grain which is both raised and consumed by the rayat. But in Mr. Charles' experiment a modification was called for, because it was not probable that the small farmer with whom he was dealing, would eat so expensive a grain as rice, though it happened that this was the crop he grew and grows.

7. I do not quite understand the modification suggested in paragraph 6, clause 4, of the Government letter. The produce is always stated in rupees, but the local estimate is also required in annas, in order that the result may be compared with that of other seasons—in fact that the varying effect of season may be properly considered.

8. The special experiment is not yet well understood and few Assistant Collectors have the aptitude for and interest in the subject, which are requisite

for a really satisfactory report. The Agricultural Department, when it has leisure and trained agency, may secure better results than heretofore; but, as matters stand, the principal benefit from such experiments is that accruing to the experimenter. I urge that the Assistant Collectors, who are at head-quarters during the principal cultivating season, have little opportunity or inducement to study cultivation and to learn anything at all about the agricultural practice of the people, and yet I believe it will be admitted that some knowledge of these subjects is essential to the proper administration of a rayatvári district. By making experiments on crops and by collecting the detailed information required for special experiments, the Assistant Collector must learn much which will be very valuable to him.

Lastly, I would respectfully represent that I do not report the whole of the Assistant Collectors' reports, but that I analyse them and thus am responsible that misleading results are not published.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Director of Agriculture,
Bombay.

Crop Experiments: Report on the ——for 1885-86.

No. 4461.

REVENUE DEPARTMENT.

Bombay Castle, 15th July 1887.

Letter from the Director of Agriculture, No. 2422, dated 29th October 1886—Submitting through the Commissioners of Divisions the usual analysis of crop experiments carried out by Revenue officers during the year 1885-86.

Memorandum from the Commissioner, N. D., No. 3518, dated 22nd November 1886—Submitting his remarks on the report by the Director of Agriculture on crop experiments for 1885-86.

Letter from the Commissioner, S. D., No. 3461, dated 22nd November 1886—Stating that he has no remarks to offer on the report.

Letter from the Commissioner, C. D., No. R.—5348, dated 30th November 1886—Submitting his remarks on the report.

Letter from Government to the Director of Agriculture, No. 1382, dated 4th March 1887—Communicating certain remarks regarding Appendix B, page 20 of crop experiments report, and calling for opinion as to the amendment of the rules regarding crop experiments as suggested therein.

Letter from the Director of Agriculture, No. 953, dated 8th June 1887—Submitting the report called for in Government letter No. 1382, dated 4th March 1887.

RESOLUTION.—The two factors in question are—

1.—What is the average produce?

2.—What does the land owe to the rayat in wages and interest?

The former can only be satisfactorily settled if the experiments are conducted (*a*) on the same land, (*b*) over a series of years, (*c*) after deducting the two worst and the two best years, (*d*) stating the annual produce in rupees, (*e*) selecting neither the best nor the worst fields nor (*f*) the best nor the worst cultivators. Though any mere estimate of the proportion of crops to the average made in a single year must necessarily be unsatisfactory, still these experiments are useful as all *facts* are, and especially, for the reasons advanced by the Director, are they useful to Revenue officers.

2. But the second issue can *never* be settled satisfactorily. Beside the infinite variations in skill and industry it is impossible to ascertain the actual labour of the family expended in the simplest processes for the production or the preparation of a crop for the market. Mr. Ozanne is of course right that the cost of production must include "a fair charge for home labour" but the question is, what is a fair charge? and Mr. Ozanne is wrong in saying that the agriculturists' subsistence is *not* mixed up with the statistics. It is most distinctly mixed up, for Mr. Charles' experiment charges the crop with 3 lbs. of grain for a year towards subsistence and the result is brought out that "the balance is not sufficient to pay the assessment."

3. The Governor in Council considers therefore that this item should be omitted. There is much risk in retaining it as unless statistics are accurate they are worse than useless, and this item is admittedly beyond verification.

T. D. MACKENZIE,
Acting Secretary to Government.

To

The Director of Agriculture,
The Commissioner, N. D.,
The Commissioner, C. D.,
The Commissioner, S. D.,
The Commissioner in Sind,
All Collectors in the Presidency Proper,
The Accountant General,
The Survey and Settlement Commissioner. } With copies of the report.

The Government of India,
The Secretary of State for India. } By letter.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1886-87.

[Price—3 Annas.]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1886-87.

133393

No. 2062 OF 1887.

FROM

W. P. SYMONDS, ESQUIRE,
Acting Director, Land Records and Agriculture, Bombay;

To

THE ACTING CHIEF SECRETARY TO GOVERNMENT,
Revenue Department, Bombay.

Poona, 29th October 1887.

SIR,

I have the honour to submit, through the Commissioners of Divisions, the usual Analysis of Crop Experiments carried out by Revenue officers during 1886-87.

2. The number of experiments made during 1886-87 was 62 against 31 in 1885-86, the increase being due to the orders of Government directing that in each district two ordinary experiments, each on the staple crops, or one special experiment in lieu of them, should be made by each Assistant and District Deputy Collector in charge of tálukás. No experiments were made in the Ahmadabad and Kánara Districts, on the ground that the officers there had no time to spare for the work.

3. It has been found necessary to omit altogether twelve experiments from this report, as the results cannot be considered trustworthy owing to want of accuracy in procedure, &c. In each case the justification for the omission is detailed in the analysis.

4. The experiments of Messrs. Todd, Silcock, Davidson, Morrieson, Fraser, Robertson, Harvey and Rájárám Khanderáv were carefully conducted and reported. It is again necessary to desire the special attention of the experimenters to the standing orders issued from time to time on the subject.

I have the honour to be,
Sir,
Your most obedient Servant,

W. P SYMONDS,
Acting Director, Land Records and Agriculture.

ANALYSIS OF CROP EXPERIMENTS.—
NORTHERN DIVISION.

Ahmadabad.

Government Resolution No. 6997, dated 1st October 1886, Revenue Department, directed that each Assistant and District Deputy Collector should carry out one special experiment or two ordinary experiments in lieu of one special experiment on a holding, but in Ahmadabad the Collector reports that no crop experiments could be made owing to frequent changes of the district officers in charge of tálukás and to other reasons.

Kaira.

Mr. K. R. Bamanji, Assistant Collector.

This officer submits two experiments on wheat of different varieties, one being *Bhália*, apparently a dry-crop soft white variety, on a *berangi káli* or mixed black soil, and the other *popatia*, an irrigated variety, on a *gorádu* or light soil. In both the plots, the wheat was preceded by kharif crops such as rice, makái, and bájri, for which the season was favourable, the bájri being estimated at 12 annas. Both the plots were manured this year and cultivation was on an average good in both cases, but wheat appears to be more successful in gorádu soil than in berangi káli or mixed black which is a poorer soil. The season was good for rabi crops, but injury by fogs and frost reduced the average of the wheat crop to $6\frac{2}{3}$ annas for dry-crop and $8\frac{1}{3}$ annas for irrigated wheat.

The results are:—

Variety.	Estimate in Annas.	Yield.	Corresponding formulæ yield.
		Lbs.	Lbs.
Experiment No. 1 Bhália	8	765	900 (Mátar.)
„ „ 2 Popatia	12	1,859	1,200 (Thásra.)

Thus the yields in both cases were above the average for the district. The incidence in column 10 (Experiment No. 2) for Popatia would of course be much lower if the kharif crops grown in the field were taken into account.

Mr. Pránlál H., District Deputy Collector.

Experiment No. 3.—Mr. Pránlál contributes one experiment, which is termed a special one, but the memorandum of expenditure and income is defective. The rule of not including the local funds in the assessment has been lost sight of, and the local name of the variety has not been given. Mr. Pránlál should pay attention to the remarks on the sample form, Director's Annual Report, page 34, 1883-84, and on pages 8 and 9, Crop Experiment Report, 1884-85.

Panch Mahálls.

Two officers made crop experiments this year in the district:—

	Ordinary.
Mr. Urquhart	1
„ Motilál Chunilál...	6

Besides these Mr. Motilál forwards 3 ordinary and 2 special experiments made by Mr. Rájárám Khanderáv last year.

Mr. G. M. Urquhart, Assistant Collector.

Mr. Urquhart sends in only 1 ordinary experiment on kharíf crop. He is, however, reported to have made a second test which he was unable to complete successfully. The experiment reported was made on rice (Jiresál). The seed-rate per acre for the transplanted area is 25 lbs. according to the formulæ for the

district while that given by Mr. Urquhart is 41 lbs. per acre, which would seem to be that for the transplanted area. The relation between *sers* and *lbs.* is not properly noted. The cultivation is stated to have been decidedly good and the soil, *gorádu kiári*, with sufficient manure. The crop was irrigated from a tank and was estimated at 14 annas. This is Mr. Urquhart's first experiment, and he seems to have taken great pains with it.

Mr. Motilál Chunilál, District Deputy Collector.

This officer sends in 6 ordinary experiments, 4 in Dohad and 2 in Jhálod tálukás of the district, one on maize, 4 on gram and one on wheat *vájia*. The maximum test area in these experiments is 2 acres 39 gunthás and the minimum 20 gunthás. It is not clear whether the areas were actually measured or not. I must again invite attention to the important point that areas entered in Village Form 3 cannot be accepted for the purposes of crop experiments and that actual measurement is absolutely essential. He has taken a great deal of trouble in making so many experiments, but the results are vitiated by inaccuracies. His experiments on gram are all made on very poor crops and hence give no correct idea of the average produce and incidence of assessment. His experiments are not reported in the statement.

Mr. R. K. Vaidya, District Deputy Collector.

All the tests taken by this officer (Experiments Nos. 5—9) refer to the previous year's season (1885-86), and are on maize, one of the staple crops of the district. The rate of seed per acre is below the average prescribed by the formulæ for the district, and the difference in yields shows the difference in tillage and soils on which the crop was grown. Whether rabi crops were grown on these plots is not noted.

Experiments Nos. 5 and 6 are tests taken in connection with the special experiments.

The results are :—

	Seed.	Yield.	Annas Estimate.	
	Lbs.	Lbs.	Annas.	
Experiment No. 5	6¼	1,231	10	Corresponding formulæ yield 16 annas, 1,600 lbs. the acre.
Do. 6	11	1,496	12	
Do. 7	10½	1,508	12	
Do. 8	11	1,284	10	
Do. 9	9¾	780	6	

Broach.

One officer in this district submits 2 ordinary experiments (Nos. 10 and 11). Mr. Chunilál reported that owing to other engagements he was unable to make crop experiments this year.

Mr. H. O. Quin, Assistant Collector.

Experiment No. 10, on wheat.—The local name of the variety is not given. The crop is estimated at 4 annas, but the character of the season is not noted. According to the formulæ a 4-anna yield is 300 lbs. of grain per acre. The actual yield in this experiment was 277 lbs. per acre. The formulæ estimate is known to be rather high for the Bhál lands of Ahmadabad and Broach. The seed-rate per acre given is less than the formulæ rate for the district (60 lbs.). Mr. Quin gives the yield of area experimented on in lbs. only without the equivalent local weight or measure.

The calculated incidence in column 10 is rather high, but the season was bad, and Mr. Quin appears to have been unlucky in his selection of the field for experiment, as the crop experimented on was below the average (6½ annas) for the district and still further below that for the táluka (8 annas). The second experiment (No. 11) was made on yellow juvár *Pila* on a *besar* soil. The usual

practice is to prepare the land for cotton, and then if the season be unfavourable for cotton, to sow juvár. This year the season was favourable to the latter crop. The rate of seed given per acre is 7½ lbs. which is less than the formulæ rate per acre (12 lbs.) but greater than the ordinary rate in the neighbourhood, *viz.*, 4 to 6 lbs.

Surat.

Of the experiments received this year from the district 1 was taken by Mr. Robertson, 3 by Mr. Pánse and 2 by Mr. Umedrám.

Mr. B. Robertson, Assistant Collector.

This officer forwards one experiment taken in the village of Supa in Jalálpur Táluka on sugarcane Malbári. The experiment was evidently made with care. Surat is the chief cane-growing district in Gujarát and the Malbári is the softest and most juicy variety. The cane in the eastern tálukás is, however, inferior to that grown to the south towards Gandevi Pargana. The land was irrigated from a well, and in years when cane is not grown, rice as kharíf, and castor-oil seed and vál (Dolichos lablab) as rabi crops take its place. The crop which was of a medium quality, fairly represented the cane crop grown in the locality which was slightly injured by a long break in September. The cultivation was fair and the yield was estimated at 12 annas. Tops and leaves were not weighed.

Mr. G. D. Pánse, Assistant Collector.

Mr. Pánse contributes 3 ordinary experiments on juvár mixed with tur. The rain favoured the tur rather than the juvár. The latter was a poor, the former an excellent crop. I have omitted the experiments because the proportion of area under each crop has not been carefully considered and because the whole area is credited with juvár. The incidence calculated on the poor juvár alone is naturally very high, though for reasons unexplained it is asserted that the juvár was from a 10—14-anna crop in the different experiments—an assertion quite unsupported by the facts reported.

Mr. Umedrám R., District Deputy Collector.

This officer took two experiments on unmanured kharíf crops raised from rábed seedlings and grown in *Gorat* soil, in which vál (Dolichos lablab) is raised as a rabi crop. The cultivation was rather careless and the incidence is calculated on the kharíf rice alone. The by-product was weighed wet owing to the prospect of rain. The experimenter remarks that the seedlings raised in a rábed plot of 5 gunthás can be transplanted into an area of 22 gunthás in Balda and 19 gunthás in Párdi. This shows that the seed per acre shown in the statement refers to the rábed seed-bed and not to the transplanted area.

Thaˈna.

Mr. Bagnell, from whom three ordinary experiments are received, is the only officer who undertook any crop experiments in this district. The Collector in his forwarding letter says :—Mr. Walker is without experience and undertook no experiment, while Mr. Sayad Nurruddinkhán made two tests in Kalyán on rice but left no notes in the office, and Mr. Heblikar's hands were too full this season with heavy magisterial and other duties to think of making any.

Mr. Bagnell's experiments were all on rice. The resulting yields in all the three experiments were high compared with the corresponding formulæ yield. The plot of Experiment No. 15 was in land reclaimed from the sea and was heavily manured with 120 cart-loads the acre of sweepings from the Bándra slaughter-house. It was sown at the commencement of the rains, no rább being used. In Experiments Nos. 16 and 17 rábed seedlings were transplanted and manured at 3 cart-loads per acre with fish and oil-cake manure in equal quantities.

The low incidence in column 10 of experiment No. 15 is due to the low assessment on the reclaimed land. The high yield shows that the land has been greatly improved by the occupant.

In Thána, grain is usually measured and not weighed. A local *ser* of the grain should therefore have been forwarded to this office (G. R. No. 8149 of 19th November 1886, Revenue Department).

CENTRAL DIVISION.

Kha'ndesh.

Mr. R. A. L. Moore, Assistant Collector.

This officer sends in two ordinary experiments, one on wheat and the other on gram. The season was favourable to both, especially to the latter. But in the returns there is still some confusion between the *ser* measure of capacity and the weight *ser*. Last year Mr. Moore reported that 1 *ser* of capacity of bájri experimented on by him in Bhusával weighed 70 tolas and again this year in Jámner both gram and wheat are reported to weigh also 70 tolás per measure *ser* of capacity each. In his detailed calculations, in spite of the entry of 70 *tolás* for both wheat and gram as the weight of the contents of the capacity *ser*, Mr. Moore has taken wheat at 70 and gram at 140 *tolás*. The samples sent to this office purporting to be a *ser* measure of each weighed respectively 142 and 128 *tolás*. This gross inaccuracy makes it impossible to report the experiments.

Mr. H. A. Hughes, Assistant Collector.

Submits two ordinary experiments on wheat (Nos. 18 and 19) which were carefully made. He writes in his forwarding letter to the Collector :—

> "It was found impracticable, these tálukás being fairly well-to-do and the cultivators being generally somewhat large land-holders, to select a holding cultivated solely by and supporting the cultivator and his family, and owing to the lateness of the season, to find any crop but wheat."

In Experiment No. 18 nearly the whole of a Survey Number, forming part of the inám of the Pátil of Kharda, was experimented on. The land grows in rotation jowári, bájri, cotton and wheat. Bájri was slightly damaged by late rain, but on the whole the season was favourable to kharíf. The local name of the variety of wheat experimented on is not given. The sample of 1 *ser* capacity measure of wheat received at this office from Chopda weighed 147 *tolás*, while the experimenter's calculations in the statement are given at 140 *tolás* both in Shirpur and Chopda. It is not stated whether any kharíf crop was grown. The incidence in column 10 is on wheat (rabi) alone.

Mr. E. C. Morrieson, Assistant Collector.

Experiment No. 20.—This officer contributes one ordinary test on wheat in Taloda. The crop suffered from scant rain during sowing and from frost and high wind in February. The name of the local variety is *gora* probably Bansi, a hard white wheat. The experiment was carefully conducted, but there is some inaccuracy in the equivalents given for the *ser* measure of capacity. In columns 18 and 19 of the return the *ser* is taken as equivalent to from 144 to 147 *tolás*, whereas in the memorandum of cost it is taken as from 146 to 150 *tolás*. If the *ser* of capacity be taken as equivalent to $3\frac{3}{4}$ lbs. the exact number of *tolás* of 180 grains will be $145\frac{5}{8}$.

Na'sik.

The extraordinarily low yields reported from this district for the years 1883-84 and 1884-85 were fully noticed in the reports for those years, while the experiment made last year showed a very high yield, much above the bumper yield of the formulæ. These unsatisfactory and conflicting results demanded explanation and a special order was passed by Government directing that "each Assistant and District Deputy Collector in Násik should conduct 6 experiments in order to ascertain the average yield per acre of the staple crops of the district —wheat, bájri and jowári—with a view to reconcile these apparently irreconcilable results."

Accordingly 8 experiments were carried out this year, 5 by Mr. Davidson and 3 by Mr. Fraser; Mr. Shirhatti and Mr. Shridhar Gundo did not find time to perform any experiments. The experiments reported appear to have been carefully made. Mr. Fraser's experiments in particular show great accuracy and attention to standing orders.

Mr. S. M. Fraser, Assistant Collector.

Three ordinary experiments on rabi wheat (Bansi, hard red), (1) dry-crop (Experiment No. 21), (2) irrigated (Experiment No. 22), and (3) partially irrigated (Experiment No. 23). No kharif was grown this year in the plots under experiment, wheat being the sole crop. The field under Experiment No. 21 borders on a *nála* or stream and is said to contain subsoil water, which may possibly render it unsuitable for kharíf crops. The season was favourable at first, but the grain is said to have been slightly shrivelled by frost, the irrigated wheat suffering more than the dry crops. The yields in Experiments Nos. 21 and 23 agree with the corresponding formulæ yields, but that in Experiment No. 22 is low. The results are :—

No.	Anna estimate.	Yield.	Formulæ yield.	Incidence of Assessment.	Weight of capacity *ser.*
21	8	328	315	15·63	115
22	14	863	1,215	14·71	114½
23	8	510	475	9·21	113¾

Mr. J. Davidson, Assistant Collector.

Mr. Davidson reports 5 ordinary experiments, 2 on hard red wheat Baksi (Nos. 24 and 25), 2 on bájri (Nos. 26 and 27) and one on linseed (No. 28). In his Experiments Nos. 24 and 25 wheat followed kharíf til, which failed, and the incidence consequently appears high as the season was not good for irrigated wheat.

Experiments Nos. 26 and 27 on Bájri.—The rain in October was excessive and proved injurious to bájri. The incidence of assessment in Experiment No. 27 is rather high, presumably due to indifferent cultivation.

Experiment No. 28, Linseed.—Since the receipt of instructions of the Government of India to prepare forecasts of oil-seed along with those of wheat and cotton this crop has attracted my particular notice, as it is grown in this Presidency as an oil-seed and not for flax. This was consequently one of the crops selected last year for special enquiry, but only one experiment was made on it on a poor soil. So it was then desired that this crop should again be specially selected for experiment this year wherever available. Linseed is reported to have been grown in Násik this year to such an extent as to affect sensibly the area under wheat. In the field experimented on linseed mixed with a little mustard was the sole crop of the year, and though the year's crop as a rule suffered from the fungoid disease, the plot under experiment escaped, and the yield (estimated at 14 annas) was 225 lbs. of linseed with 4¾ lbs. of mustard. The corresponding formulæ yield is 450 lbs. of linseed. The formulæ estimate at indiscriminately 500 lbs. the acre in every táluka without considering the soil and climate, &c., as was the case found in Dhárwár last year, appears rather high.

Ahmadnagar.

Mr. G. P. Thakár, Additional District Deputy Collector, forwards 2 ordinary experiments (Nos. 29 and 30) made by Mr. Harvey, one on jowári and the other on gram, and one ordinary experiment has been received from Mr. N. B. Mule, District Deputy Collector.

Experiment No. 29 on Jowári.—The details of cultivation are :—The area is part of a field (area—24 acres, 24 gunthás) which was left fallow for 7 years till the last year when jowári was sown. It was not manured or ploughed but harrowed 5 times with a 2-bullock hoe for 26 days. Nothing was done between sowing and reaping. The seed used was safflower mixed with jowári in the proportion of 3 to 1, but it is not clear to what area the number of lbs given is meant to apply. The amount of seed entered should invariably be the rate per acre. In the present case the formulæ rate per acre of jowári seed mixed with some other is 6 lbs., but the experimenter states that 60 lbs. safflower and 20 lbs. jowári were used. The safflower failed and the experiment was made on jowári alone, which was also damaged. The weight of grain compared with that of the straw is low. In columns 18 and 19 of the return the experimenter notes that 23½ *sers* are equal to 57 lbs. and 34 *tolás*, but does not state whether the pound

is equal to 39 or 40 *tolás*, nor does he give the weight of the *ser* measure of capacity. The information required for columns 21 and 22 of the sample form is also omitted, and it is therefore difficult to check the figures in columns 23, 24 and 25.

Mr. Harvey's second experiment (Experiment No. 30) relates to a field on which various crops are grown on different plots according to the nature of the season. It would have been interesting if the experimenter had stated (1) what kharif crop in case of scant early rainfall is followed by another kharif or rabi crop, and (2) what crops (kharif or rabi) are sown as mixed in the locality. This experiment was on gram, unmanured and sown by itself; whether kharif was grown on this land is not stated. The land was once ploughed and twice harrowed and nothing was done to it after sowing. The rate of seed (60 lbs.) is nearly double the formulæ rate for the acre (*vide* remarks on Experiment No. 29).

The yield of the test area was :—

25 *sers*=73 lbs. and 13 *tolás*; therefore
1 *ser* = $114\frac{1}{2}$ *tolás* if 1 lb. =39 *tolás*,
or = $117\frac{1}{3}$ do. 40 ,,

A *ser* of grain was not forwarded to this office, but the figures given in the return may be taken as fairly accurate. The high incidence is due to omission of the kharif and to indifferent cultivation and the year's irregular rainfall.

Mr. N. B. Mule, District Deputy Collector.

Submits one ordinary experiment No. 31 conducted in Kopargaon Táluka on wheat locally called *Sudhe*. Except that the experimenter takes his lb. as equal to 40 tolás and omits to note the prices at which the value of the crop experimented on was calculated, the test as an ordinary experiment evinces care. His details of cost and agricultural implements required for the cultivation of wheat in the táluka are interesting, but the estimates of cost of their wear and tear appear doubtful, since it is not distinctly stated whether the cultivator cultivates only one survey number experimented on.

Poona.

Only one experiment (No. 32) was received this year from this district, *viz*, an ordinary test on late or wet weather jowári crop in the Sirúr Táluka. The crop was damaged by irregular rainfall, and the result is :—

Estimate in annas.	Formulæ yield.	Actual yield.	By-product.
	Lbs.	Lbs.	
12	1,120	340	lbs. 1,800+120=1,920

The grain yield is low compared with straw. The seed rate is also low.

Sholapur.

Mr. Silcock contributes two ordinary experiments and Mr. Vádekar 1 special experiment from this district.

Mr. H F. Silcock, Assistant Collector.

Two most carefully made ordinary experiments, Nos. 33 and 34, on jowári locally called *máldandi* on two different soils in Tembhurni in Karmála Táluka of the district. Jowári and kardai were grown together, every 8 rows of jowári being followed by 1 row of kardai. The season was most unfavourable to kardai and only partially favourable to jowári, which owing to heavy October and December rains had a tendency to run to stalk, the heads of grain being small. The results per acre are :—

Experiment.	Anna-valuation.	Formulæ yield.	Actual Yield.	
			Grain.	Fodder.
		Lbs.	Lbs.	Lbs.
No. 33	8 to 10	490 to 870	430	1,505
„ 34	Do.	Do.	382	1,805

The loss of grain in Experiment No. 34 is accompanied by gain in straw. The experimenter also remarks that the straw in Experiment No. 34 fetched a higher value and the grain a lower value than in Experiment No. 33. The inference is that the *támbad* moravandi soil in Sholápur yields better grain in a season of heavy falls than *káli* moravandi, which has a tendency to grow too rank with irregular heavy falls.

Mr. V. B. Vádekar, District Deputy Collector.

This officer submits one test which he calls a special experiment, but the details of the cost of cultivation and profit are given with so little accuracy of detail that they cannot be accepted as trustworthy for record The weight of the contents of 1 local *ser* measure of the crop experimented on is not reported, nor was a sample forwarded to this office. No less than one acre was selected for experiment, but how was it measured is not noted. The value of the grain experimented on is estimated in Pandharpur Market at Rs. 2-10-8 and that of the straw at Rs. 3-0-4, *i.e.* the value of straw greater than that of the grain, which is curious.

Sa'ta'ra.

Three ordinary experiments, 2 on bájri and one on wheat, have been received from this district, all conducted by Mr. L. G. Deshmukh, Assistant Collector. This year's season was reported to have been good, both for bájri and irrigated wheat, yet the results of the experiments (Nos. 36 and 37 both on bájri) are:—

	Experiment.	Yield.		Anna-valuation.	Formulæ yield.	Incidence of Assessment.
		Grain.	Straw.			
		Lbs.	Lbs.		Lbs.	
Yield per acre	No. 36	486	17,006	10	500	5·89
„ „ „	„ 37	106	1,746	2	35	10·79

The weight of straw in both the experiments is very high compared with that of the grain The weight of straw in Experiment No. 36 is 35 times that of the grain, while in Experiment No. 37, in which the yield of grain is poor, it is 16 times only. This is curious because usually the smaller the yield of grain, the greater the proportionate straw weight. The incidence in Experiment No. 37 is higher than in Experiment No. 36 on account of difference of soil, absence of manure and bad cultivation. Bájri was mixed with tur in Experiment No. 36 and matki and hulga in Experiment No. 37 in the proportion of 3 to 1. The experimenter rightly takes the proportionate area under bájri to arrive at the results of his experiments.

Experiment No. 38.—The area experimented on is ample for an irrigated crop test. The season for irrigated wheat this year was good and the average estimate 11½ *as.* for the district. The crop under experiment estimated at 14 annas yielded 1,466 lbs. the acre. The formulæ acre yield for the táluka is 1,620 lbs. The rate of seed is nearly double the formulæ rate.

Mr. C. G. Dodgson, Assistant Collector.

Contributes one ordinary experiment made by him in Karád Táluka in a survey number—5 acres and 34½ gunthás in area, and growing gram, pávta, earth-nut, tur and sháłu. The experimenter seems to have experimented on all these crops but gives no area of test separately in the case of each crop, nor the proportion in which the crops were sown in the field, nor the areas occupied under each. Consequently with all the pains taken by the experimenter, the experiment is unintelligible and cannot yield any useful deductions. The experiment has been omitted from the statement.

SOUTHERN DIVISION.

Belgaum.

Two experiments (Nos. 39 and 40) were sent in this year from the district, both made by Mr. Sorábji Padamji. The other Assistant and Deputy Collectors, as the Collector remarks, "have been unable to make any on account of transfers and stress of work." Last year, numerous discrepancies were pointed out by the Collector and the Director in two experiments submitted by Mr. Sorábji Padamji, and this year's tests, though not quite complete and accurate, show some improvement. The experimenter explains in his remarks why the columns 4 and 5 in the tabular summary of his experiment (No. 39) on rice were left blank, but the explanation, in the opinion of the Collector, is unsatisfactory. The entries made in the return regarding manure (column 15) are ambiguous, and columns 18 and 19 do not show whether a *ser* measure of corn experimented on was actually weighed or whether the experimenter's lb. is equal to 39 or to 40 *tolás*. I am unable to check the figures in these columns, as a sample *ser* (Government Resolution No. 8149, dated 19th November 1886, Revenue Department) of the crop experimented on was not forwarded to this office. The grain yield per acre in Experiment No. 40 (1,184 lbs.) is very high for a 12-anna crop. According to the formulæ the yield is 800 lbs. the acre.

Dha'rwa'r.

Four ordinary experiments were received from this district, 2 from Mr. Knight and 2 from Mr. Purandhare.

Mr. R. Knight, Assistant Collector.

This officer submits 2 ordinary experiments (Nos. 41 and 42), 1 on jowári mixed with tur and mug, and the other on gram. In his Experiment No. 41, 10 *sers* of jowári, 16 *sers* of tur and 4 of mug were sown in the whole field 4 acres and 34 gunthás in area, but the experimenter does not note the number of rows of each crop either in the experimented area or in the acre, and it is therefore not possible to estimate exactly the area occupied by jowári and by the other crops or the proportionate yield if jowári be considered the only crop of the year. The results are :—

Crop.	Grain Yield.	Value.
		Rs. a. p.
Jowári	375 lbs.	8 14 4
Tur	26½ *sers* at 12 *sers* the rupee ...	2 3 4
Mug	10 do. 12 do. ...	0 13 4
	Total ...	11 15 0

Thus the estimated produce per acre is Rs. 11-15-0 and the assessment per acre Rs. 2-1-9, hence the percentage of assessment on gross produce is 18. The grain crop experimented on was weighed only 3 days after it was cut and the by-product was not weighed at all.

His other experiment (No. 42) is more accurate. But 1 lb. is taken as 40 tolás instead of 39 tolás usually taken for purely experimental purposes, and the sets of prices in columns 21 and 22 required by the remarks on the sample form are omitted.

Mr. V. R. Purandhare, District Deputy Collector.

Contributes two ordinary experiments (Nos. 43 and 44), 1 on jowári and the other on wheat. In his experiment on jowári Mr. Purandhare seems to

have weighed the by-product when very wet, and consequently the weight is high compared with that of the grain. He gives the weight of jowári as 144 *tolás* per local capacity *ser*. The contents of the *ser* forwarded to this office weighed 139 *tolás*. The experimenter does not give the sets of prices at which the value in columns 21 and 22 is estimated. In his second experiment (No. 44) the local name of variety of the crop experimented on is not noted, nor the proportion in which the two crops, wheat and kardai, were sown. The incidence in column 10 is calculated on wheat alone.

Bija'pur.

Mr. John FitzMaurice, Assistant Collector.

Contributes 2 tests, one on wheat and the other on gram, the results of which were embodied in a special experiment. In the experiment (No. 45) on wheat the local name of the variety is not given, probably a hard-red variety. Wheat was mixed with safflower in the proportion of 6 to 1. The experiment was confined to wheat alone and in order to ascertain the exact area under wheat the experimenter measured a 10-guntha plot in which wheat and safflower were sown in rows, 6 rows of the former to one of the latter, so that in 10-guntha area the actual area under wheat was $10 \times \frac{6}{7}$ g. $= 8\frac{4}{7}$. In his experiment on gram (No. 46) the area is below the prescribed minimum and therefore the test is inadmissible as an ordinary experiment.

Kola'ba.

Four ordinary experiments were received from the district, two of which were conducted by Mr. Drew and the remainder two by Mr. Jaykar—all on rice.

Mr. W. W. Drew, Assistant Collector.

Contributes 2 ordinary experiments (Experiments Nos. 47 and 48) in Pen Táluka on different kinds of soils growing kharif rice, the staple food of the district, but does not state whether any rabi crops were grown off the fields experimented on. The local estimate in annas is not noted. It would have been useful to know on what portion of the field ráb was burnt. The remarks on the sample form require that a separate statement showing the area transplanted from the seed-bed together with its size and proportion should be given. The crop experimented on should be weighed when it is completely dry and the result noted in columns 18 and 19. To enable me to check the figures in columns 21 and 22 the two sets of prices should have been given, those prevailing at the time of the experiment and those at the time of the 1st or 2nd instalment.

Mr. R. S. Jaykar, District Deputy Collector.

Sends in two ordinary experiments (Nos. 49 and 50) on rice in Mángaon. The area is ampler than the prescribed minimum but the by-product weighs less than the grain, which throws doubt on the measurement of the grain. Figures in columns 18 and 19 show that the experimenter's *ser* is equal to 55 *tolás*, but he does not seem to have attended to instructions to take the lb. as 39 *tolás* for experimental purposes.

Ratna'giri.

Three officers made crop experiments this year in the district. They are specially interesting, as most of them are in rábed plots with fish manure as a top dressing.

Mr. J. H. Todd, Assistant Collector.

Forwards one ordinary experiment (No. 51) on sugarcane. The name of the variety is Támbi or red. This experiment has special interest inasmuch as it represents a test on sugarcane grown in rábed plots and manured with fish manure—a case rarely to be met with in Gujarát, the Deccan or the Karnátak. The yield is estimated at 12 annas, 4,000 lbs. the acre according to the formulæ, while the actual yield is 1,260 lbs. of gul and 96 lbs. of treacle. The weight of the cane is not given and the crushed cane was not weighed. Attention is invited to the

remarks on sugarcane experiments and the manner in which the results should be shown (*vide* p. 26, Crop Experiment Report, 1883-84).

Mr. W. Doderet, Assistant Collector.

Contributes two ordinary experiments (Nos. 52 and 53), one on nágli and one on rice, both in rábed plots with fish manure. In the experiment on nágli the area is below the prescribed minimum for the dry crops (6 gunthás according to the standing orders), but the experimenter gives reasons for not selecting a larger area. He says that fish manure was used for the transplanted area, but whether ráb was used or not is not clear. The anna-valuation of the crops is not noted. The figures are rather doubtful as the crop was weighed when wet and the prices at which the value of the crop was estimated are approximate only. Mr. Doderet departing on privilege leave was unable to give further information on these points, and the Collector does not clear them. The account of the cultivation of these crops given by the experimenter is very interesting. The experiment on rice (No. 53) was on rábed plots with fish manure, but the rate of seed given is rather ambiguous.

Mr. W. C. Rand, Assistant Collector.

Forwards two ordinary experiments, one on rice (Experiment No. 54) mixed with an equal quantity of pávta (Dolichos lablab), and the other on vari (Experiment No. 55). The grain and straw were weighed when wet, and a reasonable deduction made for dryage; but whether the proportion was fixed on actual test or on mere guess is not stated, and the tests are therefore doubtful. The experimenter says that the heavy rains prevented him from taking the regular course. However the results are noted as reported. A *ser* measure of capacity was not received in this office, but the Collector reported the weight of 1 *ser* measure of rice to be 40½ *tolás* and of vari 47 *tolás*.

TABULAR SUMMARIES.

Summary of Crop Experiment

No.	District, Ta'luka, Village and Experimenter.	Crop.	Local estimate in annas.	Average per Acre.					
				Seed.	Yield of		Total value of produce.	Assessment excluding Local Funds.	Percentage of Assessment on value of gross Produce.
					Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
	KAIRA.			Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. K. R. Bamanji, Assistant Collector.								
1	Thásra (Dákor)	Dry-crop wheat (Bhália).	8	71	765 grain.	1,066 straw.	39 13 10	4 3 9	10·62
2	Do. (Thásra)	Irrigated spelt (Popatia).	12	71	1,859 grain.	...	45 3 0	3 14 7	8·65
	Mr. Pránlál Harkisandás, District Deputy Collector.								
3	Mátar (Rádu)	Soft white wheat (unirrigated).	10 to 12	87	975 grain.	1,250 straw.	41 14 0	4 1 10	9·83
	PANCH MAHA'LS.								
	Mr. Urquhart, Assistant Collector.								
4	Kálol (Málav)	Rice (Jiresál)	14	41	2,188 grain.	2,053 straw.	63 5 4	10 15 6	17·32
	Mr. Rájárám Khanderáv, District Deputy Collector.								
5	Dohad (Pusri)	Maize... ...	10	6¼	1,231 grain.	1,333 straw.	30 0 0	1 6 5	4·67
6	Jhálod (Káligaum)	Do.	12	11	1,496 grain.	1,520 straw.	36 8 0	1 5 4	3·65
7	Dohad (Abhlod)	Do.	12	10½	1,508 grain.	2,400 straw.	37 0 0	1 9 4	4·28
8	Do. (Dohad)	Do.	10	11	1,284 grain.	2,400 straw.	31 4 8	2 3 11	7·17
9	Do. (Jaykot)	Do.	6	9¾	780 grain.	1,266 straw.	19 2 8	0 12 6	4·07
	BROACH.								
	Mr. H. O. Quin, Assistant Collector.								
10	Vágra (Váv)	Wheat, hard white.	4	46	277 grain.	318 straw.	10 6 8	3 2 9	30·45
11	A'mod (Dhansoti)	Juvár (Pila) yellow.	7	7½	711 grain.	2,731 straw.	24 14 11	4 15 0	19·8

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
30 G.	The local *ser* is a weight *ser* = 40 *tolás*.	*Experiment No. 1.*—Bhália, a soft white variety of wheat (dry-crop) on a medium black sandy or *berangi káli* soil. Manured before ploughing at 15 cart-loads per acre. The usual rotation, 1 castor-oil seed, 2 rice and gram, 3 rice. Season fair, though October rain not sufficient. Rice sown as a first crop in a portion of the field, but incidence in column 10 is calculated on wheat alone. Cultivation fair though neither hoe nor harrow was used and the crop estimated at 8 annas. The rate of seed (71 lbs.) reported appears higher than the formulæ rate (60 lbs.) per acre for the dry-crop wheat in the district.
10 G.		*Experiment No. 2.*—Irrigated and manured gorádu or light brown soil growing in rotation, 1 makai, bájri, wheat; 2 tobacco. The local name of the variety grown, Popatia. Rate of manure 7 cart-loads of cowdung per acre. Cultivation good, and the crop irrigated from a well, and though season indifferent, locally estimated at 12 annas, which according to the formulæ estimates for the táluka, represents 1,200 lbs. The entry in column 6 is doubtful. Spelt has a strong persistent husk and it is not stated whether the clean grain or the grain in husk was weighed.
8 G.		*Experiment No 3.*—Soft white wheat (unirrigated) grown on dry black soil. Manured with cowdung at the commencement of June at 20 cart-loads per acre. Cultivation very good, but rainfall unfavourable and a long break damaged the crop. The anna-valuation of the yield estimated at 10 to 12 annas which represented 750—900 lbs. per acre, while the result of the plot experimented on gave an acre yield of 975 lbs.
3 G.		*Experiment No. 4.*—Rice grown continuously under the Málav Tank on a gorádu kiári or embanked rice land. Manured at 15 cart-loads per acre with cowdung as a rule, but failing a sufficient supply, with sheep and goat droppings, annually in the seed-bed and every alternate year in the transplantation area. The field was sown in June in seed-bed and transplanted in August. Cultivation decidedly good, and the field being irrigated from the tank, the season had no effect on the crop, which was locally estimated at 14 annas, representing according to the formulæ for the táluka 2,625 lbs. per acre, while the actual yield shown in column 8 here is 2,188 lbs. per acre. The amount of seed is entered as reported, but no intimation is given as to how it was calculated.
12 G.		*Experiment No. 5.*—All these experiments (Nos. 5—9) refer to previous year's season and experiments Nos. 5 and 6 represent the tests taken in connection with special experiments. Maize followed by gram and wheat grown on ráti or red soil. Cultivation indifferent and the field not broken or properly weeded and the crop damaged by scant September rain. Manured. The amount of seed sown, rather less than the formulæ rate per acre (24 lbs.) for the district.
20 G.		*Experiment No. 6.*—Maize followed by wheat, gram, and udid on a grey and black soil of considerable depth. Manured in May at 8 cart-loads per acre; cultivation indifferent and the field full of weeds. Season unfavourable and the crop damaged by a break in September. Anna-yield estimated at 12 *as.* (1,200 lbs. the acre—formulæ). Seed in Col. 5 noted as reported but less than the formulæ rate for the district. Incidence in Col. 10 lower than in Experiment No. 5 probably due to a better soil.
10 G.		*Experiment No. 7.*—Maize following wheat and gram on a bhuri soil. Manured at 30 cart-loads per acre in June. Cultivation good but the crop damaged by scant September rain.
10 G.		*Experiment No. 8.*—Soil Kothuria or mixed grey and black. Manured and cultivated as above but the yield rather lower, *i. e.* 10 *as.* in local estimate, and hence the incidence of assessment high compared with Experiment No. 7.
6 G.		*Experiment No. 9.*—Soil black. Unmanured; cultivation indifferent; the field not ploughed nor weeded and the crop injured while in ears by want of rain in September. The rate of seed as in above appears very low compared with the formulæ rate for the district, 24 lbs. per acre.
6 G.		*Experiment No. 10.*—Dry crop unmanured wheat sown every alternate year on a black soil which is reported as usually left fallow during the first year. Cultivation indifferent and yield estimated at 4 annas which represents 300 lbs. per acre according to the formulæ for the táluka. The formulæ seed rate per acre 60 lbs.
6 G.		*Experiment No. 11.*—Unmanured yellow juvár (dry-crop) on a *besar* soil after cotton has failed. Cultivation indifferent but season, though unfavourable for wheat and cotton, favourable for juvár and the crop locally estimated at 7 annas (612 lbs. per acre according to the formulæ.) Seed sown per acre less than prescribed by the formulæ.

Summary of Crop Experiment

No.	District, Ta'luka, Village and Experimenter.	Crop.	Local Estimate in annas.	Average per Acre.								
				Seed.	Yield of		Total value of produce.			Assessment excluding Local Funds.			Percentage of Assessment on value of gross produce.
					Principal product.	By-product.							
1	2	3	4	5	6	7	8			9			10
	SURAT.			Lbs.	Lbs.	Lbs.	Rs.	a.	p.	Rs.	a.	p.	
	Mr. B. Robertson, Assistant Collector.												
12	Jalálpur (Supa)	Sugarcane (Malbári.)	12	1,867 whole canes.	5,325 gul.	173 bundles on an average = 3,282 lbs. of green leaves and tops.	250	0	0	9	5	3	3·73
	Mr. Umedrám Ranchordás, District Deputy Collector.												
13	Párdi (Balda)	Rice (Kada) ...	8	94	537 grain.	1,146 straw.	12	6	10	6	1	1	48·82
14	Do. (Párdi)	Do. ...	12	94	1,444 grain.	2,853 straw.	33	6	1	7	14	3	23·63
	THÁNA.												
	Mr. H. W. J. Bagnell, Assistant Collector.												
15	Salsette (Dánde)	Rice (Kudav) .	12	100	4,220 grain.	14,253 straw.	73	12	0	0	4	0	0·34
16	Do. Andheri	Do. (Patni).	12	100	4,676 grain.	11,200 straw.	105	14	2	7	3	2	6·80
17	Do. do.	Do. (do.).	12	100	5,896 grain.	12,786 straw.	98	14	3	7	9	6	7·68

Reports, Northern Division, 1886-87—continued.

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
3 G.	37=1 local weight ser.	*Experiment No. 12.*—*Duyam* káli or medium black soil. Manured at the first ploughing with 27 loads of cowdung per acre and 1,067 lbs. of *khol* or castor-oil cake manure. Cultivation fair and the crop suffered from the commencing scant rain and a long break in August and September. The following rains were good and the crop estimated at 12 annas—5,250 lbs. of gul per acre by the formulæ for the táluka. Rotation—rice and castor-oil seed for the first two years followed by rice. Seed in Col. 5 is noted as reported, but according to the formulæ for the táluka 20,000 sets are required per acre. The yield in Col. 6 appears to justify the formulæ estimate representing a 12-anna crop in the táluka.
6 G.	Local *ser* a weight *ser*=37 *tolás*.	*Experiment No. 13.*—Unmanured rice followed by vál in this year, but usually rice alone is the year's crop. Cultivation indifferent but season favourable till the end of July, yet the crop, through September scant rain, stunted in growth. Incidence in column 10 is calculated on rice alone. The rate seed in column 5 given as reported but appears to be the rate of seed sown in the seed-bed and not in the transplanted area. The incidence in column 10 would be lower if the other crop grown on the land were taken into account as last year, though the early rains were unfavourable to rice owing to a long break in September, the late rains were favourable to other crops in the Surat District.
9 G.		*Experiment No. 14.*—Do. do. ; cultivation good.
6 G.	Measure *ser*=80 *tolás*.	*Experiment No. 15.*—Unirrigated, unrábed rice grown every year on a land reclaimed from the sea side and sweetened by heavy sweepings manure. Manured in June, July, and August with sweepings from Bándra slaughter-house at 120 cart-loads per acre. Cultivation good, but the most persistent growth of weeds in the field stunted the growth of the crop. Season, though marked by excessive rainfall, was not unfavourable to rice crops in the district. The seed was sown in the highly manured soil and the seedlings where very thick were removed and transplanted elsewhere. The yield locally estimated at 12 annas,—1,600 lbs. per acre, according to the formulæ for the táluka. The rate of seed compared with the formulæ rate (=60 lbs. per acre) high. By-product not accurately estimated.
12 G.	Do. ...	*Experiments Nos. 16 and 17.*—These 2 experiments represent rice unirrigated but rábed in seed-bed. The seedlings of both transplanted and manured after the first fall of rain, in equal quantities with fish and castor-oil cake manure at 3½ cart-loads per acre ; cultivation good and season marked by excessive rain yet favourable. Straw not weighed.
6 G.		

Summary of Crop Experiment

No.	District, Tá'luka, village and Experimenter.	Crop.	Local estimate in annas.	Average Per Acre.					
				Seed.	Yield of.		Total value of produce.	Assessment excluding Local Funds.	Percentage of assessment on the value of gross produce.
					Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
	KHA'NDESH.			Lbs.	Lbs.	Lbs.	Rs a. p.	Rs. a. p.	
	Mr. H. A. Hughes, Assistant Collector.								
18	Shirpur (Kharda Budruk) ...	Dry-crop wheat hard white.	12	67	575 grain.	1,390 chaff.	18 12 0	2 9 8	13·88
19	Chopda (Tavsa Khurd) ...	Do. ...	16	75	689 grain.	900 chaff.	26 0 0	1 15 4	7·54
	Mr. E. C. Morrieson, Assistant Collector.								
20	Taloda (Taloda)	Dry-crop wheat, "Gora" white hard.	12	78	590 grain.	827 chaff.	20 4 5	2 10 8	13·15
	NA'SIK.								
	Mr. S. M. Fraser, Assistant Collector.								
21	Násik (Vadále)	Dry-crop wheat, hard red 'Bansi'	8	33$\frac{3}{10}$	328 grain.	643$\frac{1}{3}$ chaff.	11 10 8	1 13 2	15·63
22	Násik (Násik)	Do. irrigated.	14	46$\frac{1}{4}$	863$\frac{1}{2}$ grain.	1,165$\frac{2}{3}$ chaff.	30 12 3	4 8 5	14·71
23	Do. do.	Hard red (Bansi) wheat.	8	79$\frac{2}{5}$	510 grain.	760 chaff.	18 7 7	1 11 3	9·21
	Mr. J. Davidson, Assistant Collector.								
24	Báglán (Taikhed) ...	Wheat hard red "Lál Baksi" irrigated.	10 to 11	105	945 grain.	2,220 chaff.	37 1 4	11 10 8	31·46
25	Do. do.	Wheat, hard red, "Lál Baksi" irrigated.	9	74$\frac{1}{4}$	792 grain.	1,339 chaff.	29 2 8	11 13 4	40·57
26	Málegaon (Sohegaon)	Green bájri, "Hirvigár."	12	nearly 4	522 grain.	1,775 kadba, 205 bhusa.	14 13 11	0 15 11	6·68
27	Do. do.	Do. ...	4	10	239 grain.	975 kadba, 105 bhusa.	7 5 1	0 13 8	11·67
28	Do. do.	Linseed ...	14	7$\frac{1}{2}$ linseed, and some mustard.	225 linseed and 4$\frac{3}{4}$ mustard.	...	10 15 5 and 0 3 4 = 11 2 9	0 12 5	6·94

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
8 G.	140	*Experiment No. 18.*—Wheat on a good black soil or *avalkáli jamin*. Rotation—jowári, bájri, cotton and wheat. Manured every alternate year at 15 cart-loads per acre. Cultivation good and season fair, *i.e.*, rainfall somewhat timely and sufficient, but the crop injured by intense cold and prevalent westerly wind stunting the grain. Yield estimated at 12 annas or according to the experimenter below it. Seed in column 5 high and yield in column 6 low, compared with the formulæ rates which are 32 and 800 lbs. per acre respectively. No kharif crops grown on the soil reported and the incidence calculated on rabi wheat alone.
19 G.	140	*Experiment No. 19.*—Wheat on similarly conditioned soil. Season excellent and crop estimated at 16 annas which represents locally an average crop. Incidence compared with the above experiment (No. 18) low, presumably due to better tillage and more manure (17 cart-loads per acre) used. In this and the above experiment the calculations in the statement are given at 140 tolás the *ser* of capacity, while the sample of Chopda capacity *ser* received from the experimenter weighed 147 tolás on 8th September 1887. 140 tolás seem to be the nominal weight of the Khándesh capacity *ser*.
9 G.	...	*Experiment No. 20.*—Ráychikan or light black soil growing in rotation bájri and til, or rice (kharif) followed by rabi gram or wheat. Unmanured white wheat; cultivation good but the sowing rain scant and the crop damaged by frost and February west wind. No kharif crop reported as grown. The weight of *ser* measure of capacity in Taloda weighed 146¼, while the figure in column 6 calculated at 147⅝ tolás per *ser* of capacity which shows that the corn was weighed when it was rather wet.
12 G.	115	*Experiment No. 21.*—Manured dry-crop wheat Bansi continually grown on a Kálvat or medium black soil gradually deteriorating on account of a stream or nála running through it in monsoon. Cultivation fair, but the October rain heavy which delayed the sowing for a month, and though the crop was untouched by rust the grain was shrivelled by severe cold in mid January. The yield in local estimation 8 annas, representing 315 lbs. per acre according to the formulæ for the táluka. By-product nearly double of the grain yield. Price 10 sers the rupee on March 23rd and 9 12/16 *sers* on the 10th April. One *ser* after 4 weighings on different occasions averaged 115 *tolás*. But in an experiment last year 1 *ser* wheat is reported to weigh 120 *tolás* (*vide* Crop Experiment Report, pages 12—13, for 1885-86). The difference is due to the damage to the grain done by the rust.
9 G.	114½	*Experiment No. 22.*—Irrigated Bansi or hard red wheat. Soil Barki or medium black, growing groundnut if rain early and heavy, and bájri followed by gram if rain late and less. Manured in June before harrowing at 8 cart-loads the acre. Cultivation good and crop free from weeds. Season favourable and the crop suffered from no rust but grain shrivelled by excessive cold. Yield estimated at 14 annas—1,215 lbs. the acre by formulæ for the táluka. Rate of seed rather high compared with the formulæ rate. Prices the same as above.
3 G.	113¾	*Experiment No. 23.*—Dry-crop but partially irrigated; unmanured black soil, Barki, growing continually wheat. Cultivation poor but season good and crop untouched by rust, yet grain slightly shrivelled by cold. The yield in local estimate at 8 annas—475 lbs. the acre (formulæ). Seed given as reported but compared with the formulæ rate (=32 lbs.) too high. Incidence is low compared with the other two experiments (Nos. 21 and 22) and is perhaps due to irrigation and season as the cultivation is reported poor and no manure was applied. By a comparison of the weights of the grains in these 3 experiments, (Nos. 21, 22 and 23) however, the yield in the last appears to be lightest and consequently lowest in quality.
4 G.	123	*Experiment No. 24.*—Wheat hard red Baksi (Bágáyat) on a lightish soil, irrigated from pát. Manured with ordinary village sweepings at 45 cart-loads two years ago and 13½ cart-loads last year. Cultivation excellent and season promised well but frost in the 2nd week in February injured the crop. Yield according to the local estimate 10 to 11 annas—(840—975 lbs. the acre, formulæ). Rotation—1 rice, 2 sugarcane, 3 tili, followed by wheat. Chaff compared with grain, high. The rate of seed noted as reported but appears very high, the ordinary (formulæ) rate being 32 lbs. the acre. Wheat followed tili which was stated to have turned out very badly. The high incidence is due to the land being classed as pátasthal and to its being calculated on one crop only, while two or perhaps more crops could be grown with the available irrigation.
4 G.	128¾	*Experiment No. 25.*—Soil fair brown, manured at 39 cart-loads per acre 2 years ago and 56 cart-loads last year. Other circumstances the same as above (Experiment No. 24), yet the crop locally estimated at 9 annas- 675 lbs. the acre (formulæ). High incidence in this case due perhaps to injury by frost to wheat (rabi) following the poor kharif tili (4 *as.*) which is not included in the test.
8 G.	129	*Experiment No. 26.*—Hirvigár, unirrigated green bájri. Manured at 12 cart-loads the acre. Soil medium black, growing alternately kharif and rabi crops. Cultivation distinctly good, and early rains favourable, yet a long break in September damaged the crop. Yield estimated at 12 annas—640 lbs. the acre (formulæ). Seed below the average rate for the táluka.
8 G.	129	*Experiment No. 27.*—Green bájri on a reddish black soil. Rotation—1 cotton and bájri, 2 linseed, dádar and cotton, and 3 bájri and dádar. Unmanured. Cultivation indifferent. The crop poor, *i.e.* 4 annas, much below the average for the táluka.
8 G.	117 (Linseed)	*Experiment No. 28.*—Linseed and mustard on fair black soil (reddish). Unmanured. Cultivation good and the crop though in places injured by rust locally estimated at 14 annas—450lbs. the acre—formulæ. Seed noted as reported but below the average for the district. Incidence on both linseed and mustard.

Summary of Crop Experiment

No.	District, Táluka, village and Experimenter.	Crop.	Local estimate in annas.	Average per Acre.					
				Seed.	Yield.		Total value of produce.	Assessment excluding Local Funds.	Percentage of assessment on the value of gross produce.
					Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
	AHMADNAGAR.			Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	Mr. W. Harvey, Assistant Collector.								
29	Karjat (Nimbgaon Daku) ..	Jowári "Bedri".	10	2½	385⅝ grain.	3,200 kadbi.	8 6 2	0 2 6	1·86
30	Jámkhed (Kade)	Gram	9	60	366⅔ grain.	397⅓ chaff.	8 7 0	0 14 6	10·74
	Mr. N. B. Mule, District Deputy Collector.								
31	Kopargaon (Chitali)	Irrigated wheat "Sudhe."	14	48	1,229 grain.	1,513 bhusa; 1,167 kadbi.	43 1 2	0 15 9	2·28
	POONA.								
	Mr. P. C. H. Snow, Assistant Collector.								
32	Sirur (Vadgaon Rásai) ...	Jowári "Shálu" unirrigated.	12	7	340 grain	120 chaff; 1,800 kadbi.	10 6 8	0 14 6	8·70
	SHOLAPUR.								
	Mr. H. F. Silcock, Assistant Collector.								
33	Karmála (Tembhurni)... ...	Jowári with safflower.	8 to 10	3	430 grain	1,505 kadbi.	6 15 4	0 8 8	7·78
34	Do. do. ...	Do.	Do.	5½	382 grain	1,805 do	6 2 6	0 12 1	12·26
	Mr. V. B. Vádekar, District Deputy Collector.								
35	Pandharpur (Pandharpur) ...	Jowári ...	8	7	168 grain.	875 kadbi, 6 chaff.	5 11 0	0 12 9	14·01
	SATARA.								
	Mr. L. G. Deshmukh, Assistant Collector.								
36	Khatáv (Vardhangad)... ...	Bájri	10	5	486 grain.	17,006 kadbi.	11 10 8	0 11 0	5·89
37	Do. (Ner)	Do.	2	5	106 grain	1,746 kadbi	2 3 6	0 3 10	10·79
38	Khánápur (Vite)	Irrigated wheat, 'Khapli.'	14	94½	1,466⅔ grain.	2,880 chaff.	37 11 4	1 0 10	2·79

Reports, Central Division, 1886-87—continued.

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
6 G.	...	*Experiment No. 29.*—Unmanured safflower mixed with cold weather jowári in the proportion of 3 to 1 on a field consisting of *málrán* light and *káli* black soils. Cultivation good and the field free from weeds, but the crop damaged by irregular and heavy December rainfall. The yield estimated at 10 annas—745 lbs. according to the formulæ for the táluka, but the actual yield shown in column 6 about half. Kardai was a failure and incidence in column 10 calculated on jowári alone. The rate of seed reported compared with the formulæ rate for jowári mixed with kardai—6 lbs., high. Weight of contents of *ser* of capacity not reported, nor sample of the crop experimented on forwarded to this office as required by the rules.
8 G.	...	*Experiment No. 30.*—Unmanured gram on a black soil growing cotton, jowári, kardai, linseed, til, rála and hulga in different parts of the field. Cultivation indifferent and the unseasonable and heavy December rain reduced the crop to 9 annas—300 lbs. per acre (formulæ). Rate of seed compared with the formulæ rate—30 lbs. per acre, high. No kharíf crop reported and the incidence calculated on gram alone.
6½ G.	...	*Experiment No. 31.*—Unmanured wheat "Sudhe" on black soil locally called "gaváli." Irrigated from a well and growing bájri or wheat alternately. Season fair and the crop estimated at 14 annas—1,215 lbs. the acre (formulæ). Seed rate higher than formulæ seed rate. The incidence is low because the well is not taken into count in the assessment of the land. It is a private improvement.
6 G.	113½	*Experiment No. 32.*—Unmanured dry-crop jowári (late) continuously grown on kálvat or blackish soil. Cultivation good but the crop being sown early was injured by the heavy and untimely fall of rain at the close of the monsoon. The yield locally estimated at 12 annas, representing 1,120 lbs. according to the formulæ for the táluka. Rate of seed noted as reported, but compared with the formulæ rate 10 lbs. the acre, low. Whether any kharif crop was grown on the land is not stated, but the assessment shows that the land is fit to be cropped only once. One measure *ser* of capacity is taken by the experimenter at 113½ *tolás*, but according to an actual test made on 15th July 1887 in this office with the sample received the weight is 118 *tolás*.
4 G.	146	*Experiment No. 33.*—Unmanured jowári (mál dandi) with safflower in rows at the rate of 8:1. Soil stony black locally called *támbad moravandi* yielding with a moderate rainfall an excellent crop. Cultivation good, but heavy rains in October and December brought up new weeds and grass which injured the crop. Rate of seed according to the formulæ 6 lbs. per acre. Formulæ yield for 8—10 anna-valuation represents 490—870 lbs. per acre. Safflower failed and incidence in column 10 on jowári only. One measure *ser* of the crop weighed 146 tolás at the time of the experiment, but the nominal weight is 140 *tolás*. Rotation—(1) jowári and kardai, and (2) bájri, ambádi and hulga. Area of test below the prescribed minimum.
9 G.	146	*Experiment No. 34.*—Jowári (mál dandi) under similar circumstances on a fine medium black soil called *káli moravandi*. Cultivation good and field free from weeds though the crop had to contend with a similarly unfavourable season. As in Experiment No. 33, the incidence in column 10 on jowári alone, safflower being a failure. Rotation—(1) jowári with kardai, (2) jowári with kardai or gram with wheat. This experiment compared with the above experiment (No. 33) shows smaller yield of grain, but more straw fetching a higher value and also a higher incidence (column 10).
40 G.	...	*Experiment No. 35.*—Late jowári on unmanured black soil. Cultivation good, but the rain scanty at the sowing time and heavy after the seedlings have come up about 6 inches high, reduced the crop to 8 annas—490 lbs. the acre for the táluka (formulæ). Seed less than the average prescribed by the formulæ (10 lbs.) Straw compared with grain both in quantity and value, high. Weight of contents of one local *ser* measure not reported, but the nominal weight appears to be 140 *tolás*.
6 G.	108	*Experiment No. 36.*—Bájri with tur on light black soil. Manured with cowdung and ashes. Cultivation good and season fair. The yield locally estimated at 10 annas—500 lbs. the acre according to the formulæ for the táluka. For every 3 rows of bájri one row of tur was sown, but the incidence is calculated as if the whole field was sown with bájri. Straw compared with grain very high or perhaps weighed when green and moist.
6 G.	108	*Experiment No. 37.*—Unmanured bájri with hulga and matki at 3 rows of bájri with one row of other crops. Soil hard brown. Cultivation indifferent and season fair. The crop in local estimation 2 annas—35 lbs. per acre (formulæ). As in the preceding experiment (No. 36), 3 rows of bájri followed by one row of hulga and matki, and the incidence on bájri only. Compared with the results in the Experiment No. 36, the proportion between grain and straw yield low, and the high incidence presumably owing to difference of soil, absence of manure and bad cultivation. It is not stated whether bájri in these two fields was sown for fodder only.
4 G.	110	*Experiment No. 38.*—Wheat Khapli irrigated from a neighbouring stream and well. Soil black, manured in October-November with sheep manure before sowing. Season favourable and cultivation good. The crop fairer than the average for the district (11½ annas) but less than the corresponding formulæ acre yield=1,620 lbs. Seed in column 5 more than double the average per acre prescribed by the formulæ (45 lbs.)

Summary of the Crop Experiment

No.	District, Ta'luka, Village and Experimenter.	Crop.	Local Estimate in annas.	Average per Acre.									Percentage of Assessment on value of gross produce.
				Seed.	Yield of		Total value of produce.			Assessment excluding Local Funds.			
					Principal product.	By-product.							
1	2	3	4	5	6	7	8			9			10
	BELGAUM.			Lbs.	Lbs.	Lbs.	Rs.	a.	p.	Rs.	a.	p.	
	Mr. Sorábji Padamji, Assistant Collector.												
39	Belgaum (Bastvád) ...	Rice "Ambar-sál."	...	...	892 grain.	380 husk, 56 bran, 1,440 straw.	49	0	0	2	14	0	5·87
40	Do. (Bágevádi) ...	Jowári "gund."	12	6	1,184 grain.	2,944 straw.	23	6	0	1	7	9	6·35
	DHÁRWÁR.												
	Mr. R. Knight, Assistant Collector.												
41	Karajgi (Kalsur)	Jowári "Jvála" variety "Pulgar."	8 to 10	$4\frac{1}{5}$ jowári, $6\frac{2}{5}$ tur, $2\frac{1}{5}$ mug.	375 jowári	7 káts kadbi & 4 annas worth bhus.	8	14	4	2	1	9	23·71
42	Hángal (Hángal)... ...	Gram "Kempu" red & "Kare" black mixed together.	6	60	291 grain.	...	9	2	4	3	0	6	33·14
	Mr. V. R. Purandhare, District Deputy Collector.												
43	Ron (Ron)	Jowári ...	12	$7\frac{1}{2}$	1,181 grain.	9,844 straw.	19	12	4	0	6	8	2·10
44	Do. (Sandigvád)	Dry-crop wheat.	7	22 wheat and $1\frac{1}{2}$ safflower.	244 grain.	288 chaff.	7	0	0	0	12	0	10·71
	BIJÁPUR.												
	Mr. J. FitzMaurice, Assistant Collector.												
45	Hungund (Ilkal)	Dry-crop wheat.	8	$7\frac{1}{2}$	$197\frac{1}{3}$ grain.	$289\frac{1}{3}$ chaff.	5	11	9	0	11	6	12·53
46	Do. do. ...	Gram... ...	10	5	$504\frac{1}{3}$ grain.	...	13	2	0	0	8	0	3·80
	KOLÁBA.												
	Mr. W. W. Drew, Assistant Collector.												
47	Pen (Palas)	Rice (Dodki)... ...		$50\frac{1}{3}$	1,493 grain.	1,240 straw.	36	1	11	3	4	7	9·9
48	Do. (Pátansai)	Do.	...	$63\frac{3}{5}$	1,253 grain.	1,796 straw.	28	1	0	5	0	8	17·96

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
10 G.	...	*Experiment No. 39.*—Continuous rice on good ráng (rice) land. Manured with ashes and house rubbish. Cultivation good. The land gives only one crop and no rabi crop grown.
20 G.	...	*Experiment No. 40.*—Soil yeri or black, growing jowári followed by chillies or wheat in alternate years. Manured with cowdung and sweepings. Cultivation fair, but the crop good and locally estimated at 12 annas—800 lbs. the acre according to the formulæ for the táluka. Rate of seed compared with the average formulæ estimate per acre, low.
10 G.	145	*Experiment No. 41.*—Soil black or "yeri mannu" growing alternately jowári and cotton. Cultivation average and the season fair for dry-crops. Jowári estimated at 8 to 10 annas—455 to 810 lbs. the acre, according to the formulæ for the táluka. Jowári was mixed with tur and mug, seed sown being in the proportion of 1 to 2, but the incidence calculated on jowári alone and hence high. Contents of *ser* of capacity not forwarded to this office.
10 G.	155	*Experiment No. 42.*—Gram following the kharíf rice. Soil kárálu or brown manured for rice in April; though suitable for rice, not favourable to gram. Cultivation indifferent and the crop partly damaged by insufficient rain. The yield estimated at 6 annas, *viz.* 120 lbs. per acre in the táluka (formulæ). The high incidence is due to the kharif rice not being taken into account. The yield compared with the formulæ rate of yield rather high, but probably because the grain was weighed when not sufficiently dry. The contents of the *ser* forwarded to this office weighed 154½ *tolás*. The rate of seed per acre reported is very high.
10 G	144	*Experiment No. 43.*—Continuous jowári on *kemp* or red soil not as productive as black soil; manured besides sheep manure with cowdung and sweepings at 15 cart-loads the acre. Cultivation good and the field well weeded, but the early rains timely and sufficient, yet the late rains scant and unfavourable. The crop only 12 annas in local estimation—1,120 lbs. the acre according to the formulæ. The weight of the contents of 1 local capacity *ser* is given as reported, but those forwarded to this office weighed 139 *tolás* the 1 *ser* of capacity. Straw compared with grain rather high, presumably weighed when wet and green.
10 G	146	*Experiment No. 44.*—Soil black or *Kare nela* with sand or *tavadbai*. Unmanured wheat. Rotation—jowári, cotton and wheat. Cultivation fair and season more favourable to jowári than to wheat. Sowing rain scant and the crop estimated at 7 annas—270 lbs. the acre according to the formulæ for the táluka. Wheat sown with safflower, but how many rows of wheat to safflower is not noted. Incidence in column 10 on wheat alone.
8⅛ G	85½	*Experiment No. 45.*—Wheat mixed with safflower on a black soil; manured. Cultivation bad and season unfavourable. Six rows of wheat were followed by one row of safflower. The incidence in column 10 is on wheat alone.
1 G	83¾	*Experiment No. 46.*—Area of test below the prescribed minimum. Gram on a black soil. Cultivation indifferent but season fair.
		Experiments Nos. 45 and 46 are tests taken in connection with a special experiment.
19 G	55	*Experiment No. 47.*—Soil clayey or *chikan*. Rice locally called *Dodki* manured per acre at 20 cart-loads of cowdung and 15 bundles of hay which were spread on the ground and covered with earth and burnt before the rains. Cultivation indifferent. Early rains heavy and October rains scant and unfavourable. Straw compared with grain very low. The rate of seed 50⅛ lbs. per acre sown in a rábed seed-bed and then seedlings transplanted. Formulæ rate of seed per acre 60 lbs. of sweet rice.
29¾ G	55	*Experiment No. 48.*—Rábed *dodki* rice on a different kind of soil locally called *dagadmáti* or stony soil. Rábed and with manure per acre at 20 herds of sheep folded for 1 month, 13 cart-loads of cowdung and 40 bundles of hay. Cultivation good and season the same as in the above. In both these experiments no local estimate of the yield in annas nor the equivalent of 1 measure *ser* in *tolás* given, nor the *ser* contents of the crop experimented on, sent to this office.

Summary of the Crop Experiment

No.	District, Ta'luka, Village and Experimenter.	Crop.	Local Estimate in annas.	Average per Acre.					
				Seed.	Yield of		Total value of produce.	Assessment excluding Local Funds.	Percentage of Assessment on the value of gross produce.
					Principal product.	By-product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	KOLA'BA—*continued.*								
	Mr. R. S. Jaykar, District Deputy Collector.								
49	Mángaon (Khandad)	Rice "Harkale".	12	48	1,270 grain.	1,152 straw.	25 5 0	4 3 4	16·62
50	Do. do.	Do. ...	12	48	1,427 grain.	1,473 straw.	35 6 4	4 2 0	11·65
	RATNÁGIRI.								
	Mr. J. H. Todd, Assistant Collector.								
51	Tembhya (Ratnágiri)	Sugarcane "Támbi Us."	12	...	1,260 gul and 96 treacle.	16,226 tops.	124 8 3	7 1 5 including water-rates.	5·69
	Mr. W. Doderet, Assistant Collector.								
52	Ratnágiri (Mirya)	Late Nágli "Mahán".	...	11¾	1,747 grain.	...	45 6 2	1 5 4	2·93
53	Do. (Rahatghar) ...	Rice "Vágsál".	16	270	3,360 grain.	5,280 straw.	67 8 0	7 11 1	11·39
	Mr. W. C. Rand, Assistant Collector.								
54	Sangameshvar (Vándri) ...	Rice "Panvel".	12	18 rice and 18 pávta.	1,668 grain.	7,627 straw.	38 5 0	1 4 7 including water-charges.	3·35
55	Do. do. ...	Vari "Duduora".	8	2 vari 15⅓ harik.	180 grain.	...	3 11 2	0 3 2	5·35

Reports, Southern Division, 1886-87—continued.

Area of test.	Equivalent in tolás of measure ser.	Remarks.
11	12	13
10 G.	55	*Experiment No. 49.*—Rábed rice *Harkale* on clayish soil. Manured in the seed-bed only. Cultivation fair but the field weedy. Early rain heavy and late rain continued too late. Seed-rate less than the formulæ rate—60 lbs. for sweet rice. The weight of straw in column 7 less than that of the grain, which is doubtful.
29¾ G.	55	*Experiment No. 50.* do. do. do.
3 G.	...	*Experiment No. 51.*—Sugarcane *támbi* or red on a *mál* or reddish soil, grown once in ten years, rice being the yearly crop. The land is classed as garden and irrigated from a well. No special charges for water. Manured with ráb and cowdung burnt on the land and *haid* fish manure as a top-dressing. Cultivation good and season favourable. Weight of cane produce not given, but the gul yield estimated at 12 *as.* (4,000 lbs. the acre according to the formulæ for the táluka). Rate of seed not reported; about 3,500 canes are on an average required for planting in one acre of land (formulæ). Fuel, ordinary fire-wood, at Rs. 15 for an acre produce.
3½ G.	47	*Experiment No. 52.*—Late *nágli* every year on a *kátalvat* or stony soil. Rábed in May and manured with *haid* fish manure in July. Cultivation good and season excellent for the varkas crops. Anna-valuation not reported, but the yield in column 6 indicates that the crop was not below average. Seed-rate in column 5 compared with the formulæ rate per acre (7 lbs.) for the táluka, high, but is reported to have been for the seed-bed sufficient for the transplanted area. One acre area of such seed-bed produces seedlings enough for 2 acres. Column 7 *nil* as the by-product was not taken but left for cattle to graze on. The figures are doubtful as the crop was weighed when moist. Price of nágli 32 sers per rupee in December 1886. The area less than the prescribed minimum for the dry-crop.
6 G.	40½	*Experiment No. 53.*—Sweet rice vágsál continually grown on *mál jamin* or red soil. Rábed in May. Cultivation fair and rain timely. The crop though estimated at 16 *as.*—2,000 lbs. the acre—was below the 16-anna formulæ estimate, which is perhaps due to wetness of the crop when weighed. Seed-rate compared with the formulæ rate per acre,—60 lbs., high, but applies to the seed-bed and not to the transplanted area.
5⅗ G.	40½	*Experiment No. 54.*—Rice irrigated from a stream on an alluvial soil or *umbarset*, growing rice *náchni* and *pávta*. Rábed with 240 head-loads of manure consisting of brushwood and branches, dung, dry grass and earth in equal quantities. Cultivation good and the field had few weeds; and the season though favourable for the varkas crops injured rice with its heavy rain between June and August. Yield estimated at 12 *as.* Rate of seed 18 lbs. per acre for rice given in column 5 as reported, but compared with the formulæ rate low and partly due to pávta being sown among rice. Straw compared with grain high, but was weighed when wet. Incidence in column 10 calculated on rice alone. Column 6 represents the weight of wet grain, making allowance for dryage at about 24 per cent. Weight of contents of 1 local *ser* measure not taken by the experimenter but afterwards reported by the Collector at 40½ *tolás*.
8 G.	47	*Experiment No. 55.*—Vari on a hill side or *dongar* soil. Rotation—náchni, harik, and vari. Rábed with 77 head-loads of manure consisting in equal quantities of brushwood and grass mixed with half the quantity of cowdung. Cultivation good, and rain, though heavy for rice, favourable to vari and other varkas crops, but the crop experimented on was injured a fortnight before cutting by grub or *kid* and the yield per acre in local estimate 8 *as.*—350 lbs. according to the formulæ for the táluka. The grain was weighed when wet, but the column 6 represents the probable weight of the grain when sufficiently dry, deducting dryage at 20 per cent. By-product being useless as fodder, was not weighed and the incidence in column 10 on grain yield alone. As in the above experiment, the average weight of 1 measure *ser* of the crop experimented on reported by the Collector at 47 *tolás*.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1889-90.

BOMBAY · BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1889-90.

B 637—a

CONTENTS.

	Pages.
I.—Forwarding Letter	1—2
II.—Analysis—	
Northern Division	3—9
Central Division	10—14
Southern Division	15—19
III.—Tabular Statements—	
Northern Division	20—23
Central Division	24—27
Southern Division	28—31
IV.—Appendices—	
A.—Special Experiment by Mr. Doderet	32—35
B.—Note on cost of cultivation for general guidance of experimenters	36—38

(*Rs. 5*), *Balutedárs (Rs. 2)*; *total Rs. 48-12-0, or per acre Rs. 5-6-8*". The crop was gram. Not a word of comment as to how the figures were arrived at, was vouchsafed.

I have thought it desirable to assist experimenters by exhibiting a few correct statements of the cost of cultivation of staple crops (see Appendix B).

5. Mr. Muir-Mackenzie in 1887-88 made suggestions as to modifications of standing orders which were in part approved by Government, but the *resumé* has not been reprinted with the modifications, and experimenters must find and have found it most difficult to know what is expected from them. I propose to issue as soon as possible revised instructions in time for guidance in the coming season.

6. The programme prescribed by the orders on the report of 1887-88 was duly prepared. But great difficulty was experienced by the officers concerned, and in few cases was it carried out, though it appears to have secured a larger number of experiments than usual.

I have therefore this year prepared a programme in general terms for each district, and submitted it to the Collector for adoption after consulting his assistants. I have sought to concentrate the attention of experimenters on crops of special interest or on those about which information is scanty, though needed. For instance, where sesamum and linseed are very important, numerous tests on these crops have been advised with a view to improve the oil-seed forecasts, recently instituted. I have thought it desirable to recommend further enquiry into the questions raised by the experiments made by Messrs. Cooke and Motilál in Kaira and Sayad Nuruddin in Surat. Information has been received that groundnut is being very largely grown under the Níra Canal. I have therefore tried to concentrate attention on this important crop in districts where it is already largely grown, as well as in Poona under the canal.

Little is known of the cultivation and yield of Italian millet, dry-crop chillies, coriander and niger-seed. Yet all are of importance in some districts, and attention has accordingly been directed to them in those districts. In the Konkan, further information is required as to the cultivation and yield of the dry-crops both on the plains and on the uplands.

In short, I have tried to make special suggestions which with the co-operation of experimenters will make the annual summary more consecutive and more interesting.

7. It will be observed that in column 10 of the tabular statement a note has been added to show whether the rates of the Original or Revision Survey were in force at the time of the experiment and experimenters should, in future, carefully note this important fact.

8. I have much pleasure in naming the officers who have taken most interest in the work of crop experiments and who at the same time have submitted valuable reports.

Northern Division.—Messrs. Cooke, Kennedy, Quin and Cursetji.

Central Division.—Messrs. Doderet, Cappel and Pánse.

Southern Division.—Messrs. Kánga, Sorábji Padamji, Pratt and Sheppard.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Director, Land Records and Agriculture, Bombay.

ANALYSIS OF CROP EXPERIMENTS.

NORTHERN DIVISION.

Ahmadabad.

Mr. H. O. Quin, Assistant Collector.

Mr. Quin submits one special experiment (No. 1) on a small holding of a Thákarda Koli, who also works as a labourer.

The holding is registered as 1 acre 22 gunthas, but 8 gunthas are kept permanently under grass. The soil is a light sandy loam. The holder has a wife (who works) and two small children. He owns a cow, but no bullocks. He borrows for his ploughing and sowing and afterwards for harrowing. The cultivation of the field occupies less than a month in the year, including harvesting and winnowing; while the crop is ripening the holder sleeps in the field. He borrows food from the grain dealer and pays back with 50 per cent. interest on his crop. The residue, it is said, only supports him for about a month, but he feeds his cow on the grass of his field and on the by-products of his crop.

In May he earns 2 annas a day and his food. In June and July and even up to the middle of August his labour in other fields brings him on the average 1 anna 6 pies a day and food. In September he is again free and gets work at 2 annas a day with food till about the middle of March for about 20 days in the month. He goes out for work then till end of April, earning 3 annas a day for about half the month. His wife cuts and sells bundles of grass from July to October earning about 1 anna a day, but in January and February working in threshing floors she earns 2 annas a day.

This is not an average holding for the district, but the experiment has some interest in showing how field labourers live who are also small occupants of land. Mr. Quin estimates the annual income at Rs. 77 and the expenditure on all heads at Rs. 65, leaving a surplus of Rs. 12. He thinks that perhaps the surplus is overestimated, for such persons are not provident and eat better or work less when labour is abundant or the crop good.

The possession of a small plot of land raises the status of such a labourer, and in good seasons allows him more leisure for idleness than usual. The Koli is essentially a man who does no more work than he is obliged to do.

The Collector thinks that the surplus is overestimated and remarks that the poor population in this locality subsists in the hot weather almost entirely on mowra flowers. It is to be noticed that no debit for the borrowing of bullocks is made. Such debit would swallow up the surplus at once.

Mr. J. K. N. Kábráji, Assistant Collector.

Mr. Kábráji sends two ordinary experiments (Nos. 2 and 3) on wheat and cotton in Dhandhuka. The anna valuation for the former is too high, for it is noticed that the late rains were very insufficient. The experimenter says that both crops were sown about July. This may be true for the cotton, but cannot be for the wheat.

Kaira.

Mr. H. R. Cooke.

The Collector personally made two careful tests (Nos. 4 and 5) on rice. Though the areas of the tests are below the prescribed minimum, the experiments are included in the tabular statement to illustrate the following remarks which I summarize from the Collector's report.

His object was to personally satisfy himself whether the water-rates charged for the use of the water of the river Khári are reasonable or not. Complaints had been numerous.

The tract in which the experiments were taken, is a large area, over 2,000 acres, of the finest rice land, which all received a full supply of the river water. It is *kiári*, *i.e.*, embanked rice land, and usually grows a second crop of wheat after rice.

In the present year, however, the season was late. The transplantation of the seedlings was delayed by reason of the destruction by caterpillars of the first grown seedlings and no wheat crop was possible.

The rice grown is kamod and jiri—the two best varieties of Gujarát. The cultivation is excellent. The seed-beds as well as the area of transplantation are liberally manured.

The holding comprised 6 acres 34 gunthas, assessed at Rs. 65-4-0, of which Rs. 52-6-0 represent the charge for water, though in the Village Register the charges for soil and water are not shown separately. The average charge is thus per acre Rs. 1-14-0 for soil and Rs. 7-10-4 for water. There is only a slight deviation from the average in the various numbers composing the holding :—

	Area.		Assessment.		
	A.	g.	Rs.	a.	p.
(1). The occupant cultivates	0	28	7	0	0
(2). A sub-sharer do.	0	28	7	0	0
(3). A tenant for occupant cultivates ...	3	12	31	8	0
(4). Another do. do.	2	6	19	12	0
	6	34	65	4	0

Occupant has no right over the sub-sharer's portion but receives from the tenants half the gross produce, paying the assessment and local funds and providing all the manure.

In (1) and $1\frac{1}{8}$ acres of (3) the crop was slightly inferior, because the transplantation was late. Local opinion was that the outturn would be a maund or two less per bigha ($\frac{2}{3}$ acre) than in the rest.

The tests were made in (4) on jiri and kamod rice. Of the total, kamod only occupied 13 gunthas. Jiri sells at $28\frac{3}{4}$ lbs. per rupee, kamod at 26 lbs., while the commoner variety of rice (sutarsál) grown without irrigation fetches only 1 rupee for $32\frac{3}{4}$ lbs.

The Collector has endeavoured to ascertain the net profit both for the occupant and the tenants (kheduts); but as the latter cultivated also fields belonging either to themselves or other occupants, and as these other fields grew sutarsál rice which was not experimented on, it will be better to confine this summary to the profits of the occupant only.

Occupant's expenses.

	Rs.	a.	p.	Rs.	a.	p.
1. Cultivation of his own plot of 28 gunthas—						
Labourers { Cash wages ...	... 3	13	0	5	15	0
Labourers { Grain „ ...	... 2	2	0			
Seed 15 sers—Jiri rice				0	8	6
2. Haks on the holding...				15	2	6
3. Assessment and local funds on the holding ...				61	14	3
4. Manure, 86 loads, at 9 annas				48	6	0
5. Food for family, 2 males and 4 females				162	4	0
6. Clothing do.				28	8	0
				322	10	3

The custom of the country is for the grain dealer to buy the grain at the doors of the rayat. This year he gave Rs. 1-6-9 per maund for jiri and Rs. 1-9-0 for kamod rice. The whole share of the produce which came to the khátedár was 274 maunds rice, worth at the above rates Rs. 390.

The holder keeps two buffaloes, but no bullocks. The milk is either consumed at home or sold as ghi. The sale of ghi with the rice straw is enough to keep the animals.

The net result of the experiment is that in a good year but without a second crop of wheat an occupant of 6 acres of rice land can without any labour on his own part but cultivating by tenants chiefly or by hired labour keep himself and family, in all 6 adults, in the standard of comfort common to his class, and that the good class of Leva Pátidárs.

These Pátidárs eat 3 meals a day. They live on rice and wheat. The cost of clothing is estimated at Rs. 4-2-0 for a man and Rs. 5-1-0 for a woman.

The Collector does not give his opinion as to whether he arrived at the conclusion that the water-rates are too high, but he finds that the net profit of the two tenants was Rs. 45-10-0 and Rs. 12-10-0 respectively. This, taken with the results when the occupant alone is considered, seems to show that the rates are not excessive.

Mr. J. W. A. Weir and Mr. L. G. Deshmukh, Assistant Collectors.

Mr. Weir submits three and Mr. Deshmukh one ordinary experiment on areas below the prescribed minima. There is nothing in their reports which justifies any relaxation of standing orders. These experiments are therefore rejected. I regret this in the case of Mr. Weir, for he has treated his experiments as special ones and taken considerable pains. But considering the small area fixed as the minimum, it is unsafe to base deductions on still smaller areas.

Mr. Deshmukh, however, is entitled to admission for his experiment on irrigated tobacco (No. 6).

The field is assessed at Rs. 5-11 per acre and is let out to a tenant at Rs. 23 per acre in cash. The tenant further pays the owner of the well in the adjoining field for the use of the water (3 waterings). Yet the tenant appears to have made a profit. I say "appears" because I cannot understand the calculations given.

Mr. Motilál Chunilál, District Deputy Collector.

This officer has submitted two ordinary experiments. One (No. 7) is reported. The other is still forming the subject of an enquiry. The assessment per acre is reported to be Rs. 27. As yet full explanation as to the reason of so high a rate is not forthcoming. The experiment will be entered in next year's report.

Panch Mahaʼls.

Mr. A. F. Maconochie, Assistant Collector.

Mr. Maconochie's experiments (Nos. 8 and 9) were carefully made. The seed sown on the wheat fields was *dáudkháni* from Málwa, a good white variety, but the produce is styled kátha, a red wheat. The deficiency of moisture is the alleged cause of change of colour. No sample was sent and I am unable to make further comment than that such a rapid change of colour is extraordinary.

In experiment No. 9 the result of a first year's cropping of new land was decidedly good in spite of a deficiency of rain; but a good deal of expenditure had been incurred in hand-digging and ploughing the land, estimated at Rs. 11 per acre. I think it unusual for land newly brought under cultivation to be cropped with wheat.

Mr. Pránlál Harkisandás, District Deputy Collector.

Mr. Pránlál sends eight ordinary experiments (Nos. 10—17), but has not commented on them at all. The results may be compared with the similar series taken in 1884-85 by Mr. Vaidya. In the present instance the season was more unfavourable. It is not explained how the crop at Jhálod was so very superior to the other wheat crops tested. The land is better as the assessment shows.

In the absence of satisfying comment I feel hesitation in accepting these tests as accurate from a new experimenter.

Broach.

Mr. K. R. Bamanji, Assistant Collector.

Mr. Bamanji's experiment on jowári is entered (No. 18). He cut the whole area of a pôt-number registered as Acres $1\frac{1}{10}$, but does not appear to have measured it. The calculations are inaccurate. The entry for column 11 was shown as $6\frac{1}{2}$ per cent. The value of the by-products has been understated. The experimenter reports that the people took fright when he began the experiment and began to cut the crop in several villages round. There is no need to arouse alarm by the experiments.

Mr. Chunilál Venilál, District Deputy Collector.

Mr. Chuniál Venilál made experiments on jowári and wheat (Nos. 19, 20). These, like Mr. Bamanji's experiment, show high percentages of assessment on gross produce, but cotton is the principal crop. Wheat and jowári are fallow crops, *i e.*, replace a bare fallow; the incidence on such crops does not fairly represent the average incidence.

Surat.

Mr. Sayad Nuruddin Khán, Assistant Collector.

Mr. Nuruddin Khán's experiment (No. 21) on vál shows how second crops are grown in rice land. The second crops are sown broad-cast as soon as the rice stubble is roughly ploughed in. The cost of cultivation is thus very small and the profit considerable.

The experiment on castor-oil seed (No. 22) is interesting. The residue after the expression of the oil is largely exported from this district for manure—even as far as Poona.

His third experiment (No. 23) has caused some correspondence. The number is a tank, supplying water for rice in three adjoining fields which are assessed for this facility and which have by custom enjoyed the right to the water. But the tank number is also assessed and occupied subject to the condition that it should not be cultivated except in the rabi season, after the water has dried up. It is assessed at dry-crop rates, *i.e.*, at a lower rate than would have been imposed if the occupation had been unconditional. The case is not an isolated one, but common in the Bulsár, Chikhli and Párdi tálukas. The rabi crop in part of the field was gram, which formed the subject of this experiment. In other parts of the field vál and peas were grown. The return for the gram was wretched. It will be advisable to repeat the experiment on the same and similar tank numbers in occupation next year, and it is hoped that the Collector will issue the necessary instructions.

Mr. M. B. Tyabji, Assistant Collector.

Mr. M. Tyabji made an experiment on highly assessed rice land growing cane once in four years. The assessment is Rs. $22\frac{1}{2}$ per acre. The results show a very high incidence of assessment (44 per cent.). No mention is made of any second crop, but it seems certain that such land would grow a second crop; and no comment on the high incidence disclosed by the experiment.

Mr. Tyabji on transfer left the report to be prepared by his successor—an unsatisfactory proceeding and one which fully warrants the omission of the experiment from the tabular statement.

Mr. Umedrám Ranchhordás, District Deputy Collector.

Mr. Umedrám Ranchhordás submits a special experiment (No. 24) based on five separate tests taken in one field. The holder of the holding of 36 acres 2 gunthas, assessed at Rs. 188-4-0, or a little over Rs. 5 per acre, fulfils all the conditions of a peasant proprietor, living only on the profits of cultivation. He is a Koli and has a wife and three young children. He owns two pairs of plough bullocks, four buffaloes and a cow. The holding is made up as follows:—

Wheat (15 acres 36 gunthas), rice (30 gunthas), cotton (7 acres 15 gunthas), juár and tur (2 acres 31 gunthas), tal and tur (1 acre 28 gunthas) and grass (7 acres 22 gunthas).

The conclusion arrived at by the experimenter is that in a *fair season* the holder could maintain himself and family. But he is in debt. Eight years ago he borrowed Rs. 300 for the funeral expenses of his wife's mother, to whose property he succeeded. Three years ago he borrowed Rs. 525 for marriage expenses of two daughters. The interest is at 12 per cent. per annum. He has not paid it regularly and the book-debt is now Rs. 1,100; and 22 acres of his land are already mortgaged. His house and holding are estimated to be worth Rs. 3,100. "Pema is not therefore in an insolvent condition at present, but sooner or later he will have to sell about half his holding, if not more, to liquidate his debt and he will then be reduced from the position of a peasant proprietor to that of a petty cultivator."

If the fallacy of this conclusion cannot be demonstrated, it would be one to cause alarm. It really means that in the opinion of Mr. Umedrám, presumably based on solid facts, a good cultivator cannot live on 36 acres of good land of which nearly one acre is rice land.

First.—The basis of the conclusion is not of solid facts. The only *fact* ascertained is the yield of the 6-anna crop of wheat. The outturn of all other crops is entered at the verbal statement of the holder—statements, to say the least, to be accepted with reserve.

Secondly.—Rs. 30 are included among the items of cash expenditure (Rs. 159) for bullock labour though the two pairs of bullocks are quite enough for the cultivation of the whole area. The value of the work of the home cattle is only estimated to be Rs. 24, though the keep of the same animals is entered at Rs. 206. No credit is given for the value of the manure produced by the plough cattle or the milk and ghi of the cow and buffaloes. The crop actually tested was unmanured. There is no doubt that the by-products would in this holding suffice to feed all the cattle.

Thirdly.—The debts have arisen from expenditure which the cultivator could have curtailed. He is a Koli. The real fallacy is the attempt to ascertain the outturn from one field in a large mixed holding. If a cultivator loses his status from extravagant expenditure, the assessment on his land is not to be blamed.

If Pema had only his wheat area, say, 16 acres, and if the figures of the experimenter are taken, we have the following calculation:—

	Rs.	Rs.
Yield of wheat, grain, 6-anna crop	344	
Straw	38	
		382
Jowari for food 2,160 lbs. and for baluta 600 lbs., purchased ...	72	
Clothing	24	
Oil	18	
Tobacco	3	
Condiments	12	
Liquor	25	
Cultivation Rs. 6 per acre with local funds (Rs. 5)	101	
		255
		127

Of this he would have to pay Rs. 81 assessment and the balance Rs. 46 is left.

Thus leaving the debt aside, and allowing the very liberal estimates for clothing, liquor, &c., made by the experimenter and charging hire-rates for bullocks for cultivation, the cultivator could make a profit on half his holding and that not the best half, even with a 6-anna crop. It follows then that the conclusion of the experimenter is fallacious. I have analysed this experiment with

care and labour and trust that it will induce experimenters to check their conclusions by common sense and teach them the danger of trusting to verbal statements of cultivators when there is naturally an incentive to underestimate.

An experiment on juár mixed with tur is omitted. The proportion of tur is not stated, and a guess entry is made for its value. In experiments on mixed crops, where both ingredients of the mixture cannot be tested, the greatest care must be taken to show the manner in which the mixture was made and the proportionate area occupied by each crop.

Thaˊna.

Mr. R. M. Kennedy, Assistant Collector.

Besides a rice test (No. 25) carefully made, Mr. Kennedy made an interesting sugarcane experiment (No. 26) in the Bassein táluka. The cultivation of cane in this tract has been described in my note on the garden cultivation in the Máhim and Bassein tálukas (1886). Cane is a 12-month crop, grown for the manufacture of gul, and cut in May. In the succeeding year rice is grown from rábed seedlings raised outside the cane area, and is followed by catch-crops of *vál* or *udid* for fodder in the rabi season. In the third year the area is used as a ráb seed-bed for seedlings, and when they are removed, is planted with seedlings of rice. When the rice is reaped in November, irrigated crops of *udid*, gram or sweet potatoes, are taken. The cane is again planted in April or May. The rotation is regular and covers three full years.

Mr. Kennedy's information is not quite complete, but the figure (Rs. 96 per acre) for manure for the cane crop tallies with that found by me in 1886. The manure is castor-oil-cake from Gujarát used as a top dressing in June, August and September.

Figures of experiment (A) compared with those of my note (B) of 1886 :—

	A.	B.
Good canes topped and stripped ...	... 28,200	28,500
Gul	... 3 tons	3½ tons.
Kákvi (molasses from damaged canes)...	... ⅛ ton	½ ton.

Mr. Kennedy does not give the weight of cane, nor of juice ; so that the percentages of gul on cane and on juice cannot be calculated.

He calculates the cost of cultivation at Rs. 438 per acre exclusive of the home labour, thus :—

	Rs.
Cost of canes for planting	176
Oil-cake manure	96
Fuel for sugar-boiling	20
Hired labour for planting, Rs. 25; manuring, Rs. 25; watering, Rs. 7½; weeding, Rs. 7½; cutting canes, Rs. 25, and boiling juice, Rs. 56	146
	438

But the value of the outturn is Rs. 659.

Mr. E. McCallum, Assistant Collector.

This officer sends in an experiment (No. 27) on *Garva* or late rice in Kalyán.

Mr. J. M. Cursetji, District Deputy Collector.

The experiments include a test on rábed rice (No. 28) and one on nágli or rági (No. 29) in varkas land. Mr. Cursetji took some pains to ascertain the cost of cultivation in the case of rice. He found by actual trial that 12 men took two days to cut, carry and spread the ráb material for the seed-bed (2¾ gunthas) required to plant out an acre of rice, *e. g.*, 44 head-loads of loppings and

33 of grass. The cost varies with the distance and abundance of the material. The other details of the cost of cultivation are carefully estimated.

Abstract.

	Per acre. Rs. a.
Cutting, carrying and spreading ráb material on seed-bed for 1 acre of rice (no value put on the material)	4 8
Ploughing seed-bed	0 5
Ploughing area for reception of seedlings, 1 man and plough 5½ days	2 12
Transplanting	2 2
Hand-weeding (variable)	0 9
Cutting and tying into bundles	1 4
Threshing and winnowing	1 4
	12 12

The area of seed-bed in the nágli experiment was taken to be 10 gunthas per acre of crop. I think this is too high, as the area in the case of rice is too low. The number selected for experiment was in area below 6 gunthas, so the experiment took in a portion of the adjoining number. Both were of very similar quality and character. The average is shown in the statement.

Mr. Cursetji has usefully taken considerable pains with his experiment and I feel sure has added to his knowledge of the local cultivation and the need in which it stands of provision for ráb.

CENTRAL DIVISION.

Kha'ndesh.

Mr. A. Lucas, Assistant Collector.

Forwards two ordinary experiments: one on dry-crop wheat (No. 30) and the other on gram (No. 31).

Mr. T. Walker, Assistant Collector.

Two experiments made, but they are not reported.

Cotton.—The area selected was 23 gunthas of very fine river-side soil, assessed at Rs. 38½ (original survey), but the calculations have been made on an area of 20 gunthas. It is specially reported that in this portion of the field the crop was greatly diminished by tree-shade and yet the yield was 123 lbs. of seed cotton per acre; only two pickings were made. It is better not to record the figures, because the test admittedly does not show fair average for the field. Further there are several errors of calculation in this and the next experiment, which throw doubt on them.

Jowári.—Area of test below the prescribed minimum. Experiment rejected. The weight of the ser is not, as required, recorded in column 19; and the weight of the sample ser sent to my office differed considerably from that calculated from entries in columns 18 and 19.

Mr. W. H. Lucas, Assistant Collector.

Wheat.—In an unfavourable season for rabi crops, when little wheat was sown in the neighbourhood, a yield of 514 lbs. of wheat was decidedly good (No. 32). The soil was very good and is occasionally manured. The experimental area appears not to have been made up of plots selected from different portions of the field as is nearly always advisable. The cost of cultivation is estimated at about Rs. 3-8-0 per acre, but harrowing, ploughing and sowing are estimated at the same figure which cannot be right. It would be impossible for a man to plough 1¾ acres of black soil in a day.

Mr. H. R. Shirhatti, District Deputy Collector,

Tested (No. 33) a crop of bájri sown under favourable conditions, in suitable land, fairly manured. The outturn was high, almost too high, but there appears to have been no carelessness, but the neglect to make up the area of test by two or more selected plots. The weight of the local ser of bájri is reported as 146 tolas. The sample ser sent to my office, however, weighed 152 tolas. It could not have gained, and it is noted that the result of the actual test is not entered in column 19. This omission casts some doubt on the test.

Na'sik.

Mr. W. Doderet, Assistant Collector,

Submits one ordinary (No. 34) and one special experiment (No. 35). The tables are carefully filled up. The calculations are correct (with one exception) and due care has been taken to leave no doubt as to the entries under each column.

The rate of seeding for bájri (5 lbs.) and wheat (43 lbs.) are carefully estimated and the results coincide with my experience. The formulæ entry (9lbs.) for bájri for this táluka seems therefore too high. In the same way the tests for the weight of the local ser are careful and may be accepted as correct—bájri 144 tolas, wheat 140 tolas.

The cost of cultivation, Rs. 5½ per acre for bájri and Rs. 8½ for wheat, are at all events approximate, the cost in the latter case being greater because of the greater cost of seed and of reaping and preparing for the market or for use in the case of wheat. The cost is calculated on the supposition that the labour was paid for—the only supposition on which the estimates can be based. They are, therefore, in excess of what the actual cost to the cultivator is, provided he is careful and provided he is not a loser by cattle disease.

Mr. Doderet's special experiment is given in full in the appendix. It shows careful enquiry and judgment, and the net result may be stated as follows: A cultivator tilling 10½ acres of dry-crop land in the Kalvan táluka of Násik, in a year when the crop (jowári) on 1½ acres nearly failed and when the principal crop (wheat) was decidedly below average, was able to feed and clothe himself and family (of wife, child and babe) without any resort to day-labour, and that further, with this area of land the cultivator has kept out of debt.

It is my duty to make fair comments on the details of the experiment.

(1). The detail of the numbers making up the joint holding is not given. This is very necessary, for there is nothing on record to show the assessment on each field of the holding. In this experiment the necessity was unusually great, for it is casually remarked that part of the holding is held on a privileged tenure, the occupant being a Deshmukh.

(2). The incidence of the assessment on the net produce should have been calculated on the supposition that the occupant held all the land at full rates: because it makes a considerable difference. The entry of column 33 which shows the incidence as 10·2 is therefore misleading. It is, moreover, incorrect. Even taking the average assessment, as Mr. Doderet does, at 14⅓ annas per acre and the net produce at Rs. 9-2-8, the incidence comes to 9·7 per cent. and not to 10·2 per cent.

(3). It would have been better, if not to take the figures for the jowári yield from those of experiment No. 29 of 1888-89 on the same variety of jowári in the same táluka on inferior land, at least to check the occupant's estimate thereby. That experiment was made by Mr. Doderet himself and he found the value of the poor yield of jowári to be Rs. 15 per acre. It was leaving too large a margin to take the occupant's estimate of Rs. 3 for the yield of 1½ acres.

The experiment, however, is careful, and it has added to the experimenter's knowledge of the condition of the táluka and of its agriculture, which cannot fail to be of use to him and to others.

Mr. S. B. Chitgupi, District Deputy Collector.

The District Deputy Collector, Mr. Chitgupi, made an experiment on pátasthal rice on green-manured land. It is interesting, but I cannot report it, because the crop was cut on December 9th and left in charge of the Mámlatdár till February to be weighed. Mr. Chitgupi was transferred in January. He ought to have completed the experiment. I must make it a rule to reject all experiments (unless under special circumstances) begun by one officer and left to be completed by another. In this case it was wrong to keep the owner's crop two months, causing him inconvenience and loss and tending to make experiments unpopular.

Ahmadnagar.

Mr. R. B. Stewart, Assistant Collector,

Has experimented (No. 36) on irrigated hard white wheat (Bakshi). He does not give the weight of the straw. His estimate of the cost of cultivation (Rs. 33 per acre) is unsupported by calculations which would carry conviction. The cost of irrigation alone is given at about Rs. 18 per acre, but 3 mots would irrigate more than 7 acres. The cost of sowing is the charge for the man only and not for cattle too, and yet the figured statement shows that the four-coulter-drill was used. If experimenters attempt to estimate cost of cultivation they will not err if they show in detail how the estimates are arrived at.

Mr. V. B. Vádekar, District Deputy Collector,

Submits a special experiment (No. 37) on a holding of 12 acres 18 gunthas, assessed at Rs. 4, sown wholly with jowári and kardai. The yield was very low, for the late rains were scanty and on such light land the season was very unfavourable. The holder has a wife but no child. Neither work as day-labourers, but subsist on the produce of this field. The occupant owns two oxen. He borrowed six others for ploughing, but repaid the loan by labour in the lender's fields. He hired for sowing at a cost of Rs. 1⅛. No other hired labour was employed.

The outturn by the test was—

Jowári (grain).	Kardai.	Kadbi in bundles.
Lbs. 1,594.	Lbs. 700.	3,735.

Cost of living at 1½ lbs. of grain per adult for 12 months and of cattle-food for 7 months at 15 bundles a day, being deducted, there remained jowári 500 lbs. grain, 585 bundles of kadbi and 700 lbs. of oil-seed.

The balutedárs cost 137 lbs. of grain and 320 bundles of kadbi—not too low an estimate. Turning the remainder into money we have—

	Rs. a.	Rs. a.
363 lbs. jowári, at 38½ lbs. per rupee ...	9 8	
265 bundles = 406 lbs., at 154 lbs. ...	2 10	
700 lbs. kardai at 42 lbs.	16 10	
		28 12
Deduct—		
Cost of seed ...	3 0	
Hired labour	1 8	
Local funds	0 4	
Oil-cake purchased for cattle ...	5 0	
Condiments, 8 annas a month	6 0	
Oil, 12 annas a month ...	9 0	
		24 12
Balance ...		4 0

There are left only Rs. 4 for the assessment (Rs. 4) and for clothing (estimate Rs. 15), or a deficit of Rs. 15. It seems then that even with this poor season and this poor land, a poor cultivator can subsist with a little borrowing. He is already Rs. 60 in debt. In a good season a far better result would be shown and with this surplus of such a season the deficiencies of a poor season can be made up.

Poona.

Mr. E. L. Cappel, Assistant Collector.

Mr. Cappel's two experiments (Nos. 38, 39) on onions give valuable information as to the market gardening of the Khed táluka, which largely supplies the Bombay market. The double test was most useful, for otherwise the great difference between the formulæ estimate and the results of experiment would have thrown doubt on the latter. The experiments are well worked out and the calculations are all correct. The standing rules are followed accurately.

Shola'pur.

Mr. A. C. Logan, Assistant Collector.

The experiment (No. 40) on Jod wheat shows partly the reason why the cultivators prefer the inferior to the superior quality of wheat. The inferior variety pays better and is moreover rust-proof.

Mr. N. B. Divátia, Assistant Collector.

I reject an experiment on late jowári mixed with safflower by Mr. Divátia. He says that the mixed crop was sown with the tiphan or three-coulter drill and that there were three rows of kardai to seven of jowári. This seems impossible. It must have been 1 to 2 or 1 to 5 according to whether the safflower was sown in the up and down journey of the drill or in the down journey alone.

Mr. B. R. Heblikar, District Deputy Collector.

Mr. Heblikar's two experiments on jowári and bájri are not entered in the statement. The Collector remarks that the report is wanting in interest; but the reason why the experiments are rejected is that the equivalents of the weight and measure ser are untrustworthy.

The calculations are based on the equivalent being taken as 140, 144, and 102 for jowári, bájri and kardai, respectively, no sample sers being sent. When after demand they were sent, the experimenter gave the equivalents at 134, 139, and 100, respectively, remarking that they had lost weight. In my office the correct weights were found to be 129, 134, and 98.

Sa'ta'ra.

Mr. P. C. H. Snow, Assistant Collector.

Mr. Snow's experiment on bájri and tur mixed is not reported. The calculations indicate an absence of the usual care bestowed by Mr. Snow on this work. The experiment is styled a special experiment and yet the area of the land cultivated by the occupant is not even given.

It is said that the family or aggregation of families is composed of 39 persons. The undivided Hindu family is often no doubt large, but he would be a rash man who would choose the occupancy of such a family for a special experiment within the meaning of the rules.

Mr. G. D. Pánse, Assistant Collector.

Mr. Pánse has submitted two very careful experiments which he has worked up with great minuteness and intelligence. The village selected, Yelur in the Válva táluka, is situated in the rich valley of the Várna and is celebrated for the excellence of its cane plantations. It possesses 120 iron sugarcane mills, which are hired at Re. 1 a day. One interesting fact is reported that the beggars who usually crowd round at cane-crushing time do not like the juice expressed by an iron-mill. I fear the cultivators will not long enjoy this immunity from charity.

Sugarcane (No. 41) is grown as a 12-month crop. It is said to be watered once in four days. The land was ploughed with a team of five pairs drawing a heavy plough, an acre in four days for the first and in three days for the second ploughing. The manure was purchased. After spreading by manual labour it was ploughed in by the heavy plough, one acre taking 2½ days. The same plough was used for making the furrows, one acre in two days. Besides the three men working the plough four others were engaged. The sets were purchased, 6,400 per acre. The details of the cost of each item of husbandry and of the preparation of the gul are as follows, the figures being given per acre. The field was 1 acre 35 gunthas :—

Operation.		Materials.		Labour.		Cost per day.		Total Number.			Total Cost for A. 1 g. 35	Cost per Acre.
No.	Description.	Description and amount.	Cost.	Men per day.	Bullocks per day.	Men.	Bullocks.	Days.	Men.	Bullocks.		
			Rs. a. p.			A. p.	Rs. a. p.				Rs. a. p.	Rs. a. p.
I.	Ploughing—											
	(a) First	..	..	2	10	2 6	0 3 0	8	16	80	17 8 0	9 5 4
	(b) Second	..	..	2	10	2 0	0 3 0	6	12	60	12 12 0	6 12 9
II.	Manuring—											
	(a) Making heaps	..	..	5	..	2 0	..	5	25	..	3 2 0	1 10 8
	(b) Spreading	..	..	3	10	2 6	0 3 0	5	15	50	11 11 6	6 4 0
	(c) Cost with carting	..	..			50 cart-loads.					62 8 0	33 5 4
III.	Levelling	..	..	4	10	2 3	0 3 0	4	16	40	9 12 0	5 3 3
IV.	Cost of seed	..	12,000 seedlings at Rs. 1-8 per thousand.								18 0 0	9 9 7
V.	Sowing the joints	..	..	6	..	2 0	..	4	24	..	3 0 0	1 9 7
VI.	Fencing—											
	(a) Fencing	..	..	10	..	2 0	..	1	10	..	1 4 0	0 10 8
	(b) Cost of thorns	..	..	..	..	..	..	..	..	..	2 0 0	1 1 1
VII.	Weeding	..	..	1	4	2 0	0 3 0	4	4	16	3 8 0	1 13 10
VIII.	Watering	..	..	2	2	1 9½	0 3 0	270	540	540	161 4 0	86 0 0
	(a) Mot, náda and ropes, &c.	..	..	..	..	..	..	..	..	..	11 4 0	6 0 0
IX.	Cutting and carrying	..	..	4	..	3 2½	..	5	20	..	4 0 0	2 2 2
	(a) Removing the canes to the mill	..	..	3	..	4 0	..	5	15	..	3 12 0	2 0 0
	(b) Cutting	..	..	2	..	4 0	..	5	10	..	2 8 0	1 5 4
X.	Working the Mill—											
	(a) Crushing	..	..	2	..	5 0	..	5	10	..	3 2 0	1 10 8
	(b) Driving—											
	1. Men	..	..	2	..	4 0		5	10	..	2 8 0	1 5 4
	2. Bullocks	..	..	..	10	..	0 3 0	5	..	50	9 6 0	5 0 0
	3. Oil	..	..	..	..	..	..	..	..	..	1 0 0	0 9 6
XI.	Making Gul—											
	1. Boiling—											
	(a) Gulvya	..	..	1	..	5 0	..	5	5	..	1 9 0	0 13 4
	(b) Assist. do.	..	..	2	..	9 6	..	5	10	..	5 15 0	3 2 8
	(c) Drying the crushings	..	..	2	..	4 0	..	5	10	..	2 8 0	1 5 4
XII.	Cost of fuel	..	14 cart-loads at Rs. 1-8.0			per cart		of Bombay hemp stalk.			21 0 0	11 3 2
XIII.	Hire of implements (iron mill, &c.)	..	..	..	..	..	..	..	..	..	7 13 0	4 2 8
XIV.	Balutas	..	..	..	..	..	..	..	..	..	10 4 6	5 7 9
										Total Cost	392 15 0	209 9 9

The result shows a large profit of Rs. 169 per acre without taking any count of the valuable by-products, part of which are used as cattle fodder and part go to the manure heap. It seems that the megass or refuse cane is not used in the boiling, as in some places. At all events fuel was purchased.

The experimenter chose three plots to make up the six gunthas cut.

The details of the yield were :—

Per Acre.

Canes	...	...	...	34,000 (weight not given).
Juice	...	...	..	42,680 lbs.
Gul	...	...	...	7,466 lbs. or 17% on juice.

Groundnut (No. 42) is one of the crops which comes in the cane rotation. The capital required is very much less. As a rule it receives no manure, for it follows cane which is manured, but in the present case a light manuring was added. It is twice watered. Once about 2 months after sowing (in June) and again one month later. It is an 8-month crop. The following table prepared by the experimenter gives the details of cultivation and cost of each operation per acre :—

Operation.		Materials.		Labour.		Cost per Day.		Total No.			Total Cost.
No.	Description.	Description and amount.	Cost.	Men per day.	Bullocks per day.	Men.	Bullocks.	Day.	Men.	Bullocks.	
			Rs. a. p.			A. p.	A. p.				Rs. a. p.
I.	Ploughing	..	..	3	10	2 0	3 0	2	6	20	4 8 0
II.	Clod-crushing	..	..	2	6	2 6	3 0	½	1	3	0 11 6
III.	Manuring		6½ carts	of ma	nure at	the rate	of Re. 1	per	cart.		6 8 0
IV.	Harrowing, 1st and 2nd	..	..	2	2	2 6	3 0	½	1	1	0 5 6
V.	Sowing and cost of seed	Seed	2 0 0	5	2	2 6	3 0	½	2½	1	2 9 3
VI.	Hoeing	..	..	1	2	2 0	3 0	½	1	1	0 4 0
VII.	Watering	..	..	2	2	2 6	3 0	4	8	8	2 12 0
VIII.	Weeding	..	..	5	..	2 0	..	1	5	..	0 10 0
IX.	Watching	..	..	..	..	..	..	..	..	..	2 0 0
X.	Digging	..	..	2	10	2 6	3 0	1	2	10	2 3 0
XI.	Removing	..	..	30	..	1 6	..	1	30	..	2 13 0
XII.	Cart-hire	..	..	..	..	..	..	..	..	..	0 12 0
XIII.	Balutas	..	..	..	..	..	..	..	..	..	0 12 6
									Total ..		26 12 9

Mr. G. W. Scott, District Deputy Collector.

Mr. Scott took two ordinary experiments on irrigated crops, jowári (No. 43) and wheat. He selected very extensive areas. The danger of too great an area is as large as that in too small an area. The danger consits in the difficulty of preventing tampering with the cut crop, however careful the experimenter may be. Such extensive experiments take up more time than is demanded from experimenters. Mr. Scott's explanation that he "could not get smaller areas" is no explanation. The experiment on Khapli wheat is not reported, for it is not stated whether the figures entered are for the husked or unhusked grain.

SOUTHERN DIVISION.

Belgaum.

Mr. W. D. Sheppard, Assistant Collector,

Sends in two ordinary experiments on rice (Nos. 44, 45).

In the first, the area of the rábed seed-bed is stated to have been 6⅓ gunthas. As the ráb (50 head-loads of cowdung cakes) was good, the area of transplantation, 25 gunthas, appears very small, and it is probable that the seedlings raised on the seed-bed were used for other areas. It is reported that 97 lbs. of seed were sown on the seed-bed. If it provided seedlings for only 25 gunthas the rate of seeding shown by the experimenter is correct, but, as I have said, a seed-bed of this size ought, with cowdung ráb, to give seedlings for a very much larger area. The occupant has another rice field of 1½ acres and probably the seed-bed was for both fields. The Collector suggests a difficulty in the directions of the standing orders, regarding the actual test of the weight of the contents of the local ser. The order is that "the grain must be well dried. * * *. The test shall not be made till at least 7 days after the crop is reaped." The necessity of the caution is obvious, but a practical method of observing it may not be evident. It may be suggested then, that about 1¼ sers of the grain should be kept for a week or 10 days, and that then the final tests should be made. This quantity will serve as the sample ser to be sent (provided that only the exact contents of the ser by heaped measure be sent).

The second experiment was on rice drilled directly, and it is interesting to compare the results with those of the rábed and transplanted rice. This latter yielded a much better crop on land more lightly assessed. The experimenter describes the cultivation of non-transplanted rice. The ground is prepared by a heavy ploughing followed by a clod-crusher. The ploughing is done early in the season as soon as the old crop is reaped and is repeated twice or thrice. From time to time the harrow is used to stir the soil and get it into tilth. The seed is drilled with a six-coulter drill in May before the monsoon, but after light showers which are usual. Immediately after sowing, manure of cowdung and ashes is put on the field, probably by hand.

This is very different from the ráb cultivation of rice and more expensive. The seed-bed in the latter is generally not touched till the seed is sown with the heavy monsoon rain. The seedlings are so thick that the weeds do not get a chance. The outside area is ploughed once in deep mud and the seedlings are transplanted by hand. The collection and spreading of the ráb and the hand transplantation of the seedlings are costly operations, but not so costly as the frequent ploughings and harrowings in the non-ráb system.

The particular field of experiment, is occupied by a money-lender, who leases it for a fixed amount of grain valued at Rs. 11-4-0, the assessment being Rs. 3-8-0. His *profit* is thus twice the assessment. The experimenter after deducting the payment to the money-lender and the cost of cultivation, finds that the cultivator makes a profit of three times the assessment.

Mr. Gursidápa Virbasápa, District Deputy Collector,

Submits a special experiment (Nos. 46,47) which requires careful analysis.

The holding consisted of dry-crop land growing jowári alone this year; area 16 acres 37 gunthas; assessment Rs. 20. The occupant, a widow, sublet the land to a cultivator, she agreeing to pay the rent and share the produce. The gross outturn is valued at Rs. 140 after deductions of customary dues to the carpenter, blacksmith and other village servants at the rate of 12 per cent. of the outturn of grain, and after deduction of the seed required for the next year's crop.

The occupant thus cleared nearly Rs. 50, which is considered and must be considered a handsome return. But the details of the calculations of the profits of the cultivating tenant show a loss of Rs. 143. The Collector points out certain errors in the calculations, but such a result arrived at by an officer of long experience must be thoroughly sifted.

I find on the experimenter's own figures (which in detail *appear* careful) that the cultivator hired coolies and plough-cattle at a cost of Rs. 27½ for one field and Rs. 16 for the other. He paid Rs. 7-8-0 for manure purchased. Total Rs. 51. The labour which he personally provided was worth at hire rates Rs. 13½ and that of his cattle Rs. 15. Total Rs. 28½. He also provided manure worth Rs. 3-8-0.

Thus by the figures he received Rs. 70 and paid Rs. 51 and for the difference (Rs. 19) he gave labour and material worth Rs. 32. This is a poor result.

I doubt the number of coolies alleged to have been employed to weed and otherwise assist. Exact dates for each operation are given. No cultivator keeps a cultivation book and so these must have been guessed dates.

It may be taken then that the cultivator did not do well in his venture, but it is against common sense to suppose that he actually incurred loss. But again it is altogether incorrect to charge as the experimenter has done,

	Rs.	a.	p.
Food for cultivator and family for 12 months	42	7	0
Clothing and oil and condiments	34	8	0
Feed of cattle	50	4	0

besides the full value both of home (Rs. 32) and hired labour (Rs. 51).

Not only is home labour thus charged twice over, but it is presumed that the cultivator must live for the whole year on the profit of cultivating two fields.

At most he was occupied 56 days in work and 52 in watching his crop, and his cattle only 42 days in the year. Both he and his cattle could have cultivated double the area, or he could have hired out his cattle and worked (as he does) as a labourer.

It is a case where common sense ought to have guided the experimenter. How could a man as he supposes afford to keep a pair of bullocks costing Rs. 50 and doing work only worth Rs. 14-8-0?

Bijápur.

No experiments were made and no explanation has been received.

Dhárwár.

Mr. C. P. W. Wiltshire, 1st Assistant Collector.

Mr. Wiltshire's experiments (Nos. 48, 49) are reported; though it is a question whether the experiment on cotton in which only the first picking was estimated should have been entered. In the sugarcane experiment, the yield is greatly above the formulæ estimate. No hint is given as to the weight and number of canes, and the percentage of juice on cane, or of jagri or gul on cane and juice. These percentages are very valuable in cane experiments.

Mr. Sorábji Padamji, Assistant Collector.

Mr. Sorábji Padamji's experiments (Nos. 50, 51) are good and interesting. The cultivation of dry-crop chillies deserves to be recorded. Chillies are thus largely grown in some tálukas of Dhárwár, though elsewhere in the Presidency they do not succeed without irrigation.

Cost per Acre.

		Rs.	a.	p.
1.	Ploughing 1 acre a day	0	8	0
2.	Cross-ploughing	0	8	0
3.	Harrowing 2 acres	0	4	0
4.	Making furrows	0	6	0
5.	Cost of nursery and seed	1	0	0
6.	Transplanting, 8 women one day	1	0	0
7.	Bullock hoeing, five times, ½ acre a day	2	8	0
8.	Hand-weeding, 6 women per acre	0	12	0
9.	Watching (estimate)	0	6	0
10.	Picking, 7 boys per acre	0	7	0
		7	11	0

I have slightly altered the reported figures and think that items 6 and 10 are under-estimated. The cultivation of irrigated chillies on the Bhadgaon Farm costs about Rs. 47 per acre, but the crop is about 3,000 lbs. as compared with the outturn of 640 lbs. of the experiment. The formula estimate for an 8-anna crop is 2,100 lbs. for dry-crop chillies, which is excessive. Over 10,000 maunds, valued at ¾ lákh of rupees, of chillies were exported from Dhárwár by rail alone in 1888-89. These are almost all dry-crop chillies.

The cropping of the river side land is interesting. In one survey number the crops were:

	A.	g.	
Chillies	2	28	All dry crops, but land annually enriched by silt deposits during the river floods.
Navani (Italian millet)	4	37	
Kulthi	2	5	
Cucumbers	0	16	
Cotton...	3	20	
Sesamum	0	4	
Grass	6	28	
Total ...	20	18	

Mr. R. E. Kánga, District Deputy Collector.

Mr. Kánga has sent in a very labouriously worked out special experiment (Nos. 52 to 57). An analysis will be more readable than all the details reported. The holding, made up of two numbers, measuring 36¾ acres assessed at Rs. 33, is situated in the black soil of the Ron táluka, where there are no facilities for irrigation.

		A.	g.
Cropping	(1) Exotic cotton	16	14
	(2) Wheat, safflower and jowári	2	30
	(3) Jowári, gram and linseed	17	24
		36	28

The cotton was sown in one number and the mixtures in the other. In (2) there was a little jowári mixed with wheat, and eight rows of this mixture were sown to one of safflower. In (3) there were 6 rows of jowári to one each of linseed and gram. In (2) also safflower was sown around the head lands.

The area under each crop was estimated under the Circle Inspector's Rules by a Circle Inspector in the experimenter's presence, by measuring the area under each mixture and estimating that under each ingredient by the relative number of rows or by the seed, where, as in the case of wheat and jowári, the seed was mixed.

The outturn of each crop was calculated carefully. Thus the test for the wheat was made on an area of 11¼ gunthás equivalent to 10 gunthás of pure wheat, the jowári being neglected, as its very small area would not affect the yield of wheat. So the test area for jowári was really 53 gunthás equivalent to 40 gunthas of pure jowári, due deduction being made for the gram and linseed. All the safflower and all the linseed was reaped. The gram was not ripe and so a test was made (Experiment No. 57) on a similar field on similar soil at Navalgund, and the results applied to the special experiment.

No doubt the holding was a complicated one, but this is the rule and not the exception in the locality, and the object of the experimenter was to obtain a holding of fairly average size and cultivated by an occupant living solely on the profits thereof.

I may parenthetically remark that though it is necessary for the Circle Inspector to credit each crop in a field with its area, in the case of an experiment on a mixture it would be generally wiser and simpler to take a fair area of the mixture, cut all the crops in it and calculate the outturn *for the mixture*. If all the crops are not ready, the yield of the crops not tested must be estimated by other tests on similar mixtures. This procedure would have greatly simplified the present experiment, if an approximate estimate for the jowári mixed with the wheat had been added.

To resume. The areas under each crop and the outturn of each—on the presumption that it was the sole crop—being found, the gross outturn of the holding was arrived at. In the case of cotton, only the first picking was taken into account, because it is alleged that the three later pickings yielded absolutely nothing owing to violent rain. Whether the loss was so absolute, may be questioned.

The gross outturn of cotton, grain, oil-seeds and by-products useful as fodder, was valued at Rs. 376-9-0.

The family consists of three brothers, two women and three children. They own one pair of plough-bullocks and a cart. On occasions, when sowing or thrashing require more pairs they borrow and in their turn lend to their neighbours. The figures show that the home pair worked 88½ days and were assisted by an outside pair for 18 days.

The family keeps two milch buffaloes and there are also two calves.

The cash payments were few.

	Rs.	a.	p.
Purchase of seed	8	0	0
Picking cotton	2	0	0
Cleaning stubble	2	8	0
Folding sheep	6	0	0
Haks to balutedárs	3	0	0
Local Funds	2	1	0
	23	9	0

Deducting this sum from the value of gross produce a balance remains of Rs. 353. From this if the assessment (Rs. 33) and the cost of feeding the plough-cattle (Rs. 92) be deducted, a sum of Rs. 228 or 19 Rs. per mensem is left for the feeding and clothing of the family in return for the labour bestowed.

The experimenter is justified in saying: "The result shows that a fairly large family—I may call it a typical agricultural family—can maintain itself in comfort on the cultivation of about 36 acres of land."

There is further proof adduced that this is the result. First, the family can afford to keep two milch buffaloes. Next, the holder borrowed Rs. 500 some years ago for a marriage. Last year he paid off Rs. 100 and he expected to pay a similar sum this year, but the damage to his cotton crop will make it hard for him to pay more than Rs. 50.

The results may be shown in another way. The cultivation charges, inclusive of home labour of man and beast, are estimated at Rs. 102. After payment of assessment, a balance of Rs. 240 remains. In other words, the balance remains after the land has paid the full value of labour and materials expended on it during the season of the experiment.

The result is very satisfactory and compares very favourably with the results of Mr. Umedrám's experiment (No. 28) in Surat. Mr. Kánga has left as little as possible to guess work. He has taken immense pains with the cost of cultivation.

Kolába.

Mr. E. M. Pratt, Assistant Collector.

Mr. Pratt has submitted four valuable experiments (Nos. 58 to 61) selected with discrimination and carried out with care. His work deserves the commendation bestowed upon it by the Collector.

All were on rice—grown continuously—in a táluka where revision survey operations are in progress. The first two were on rice land reclaimed from the sea. The third on *varkas* or uneven high lying land converted by excavation and levelling into rice land, and the last on good low-lying deep rice land. In the reclaimed lands the conditions were very different. In one case, great skill had been shown in the reclamation which had advanced so far as to grow sweet rice and is cultivated by an Ágri—a good type of cultivator. In the other, the owner is a resident of Bombay who cultivates on the *ardhil* or half share system.

The land was much neglected "as such lands almost always are." The sea had got in about two years ago, and the reclamation dykes are badly looked after. In the sweet rice lands as well as in the well reclaimed salt rice land of the second experiment, the seedlings were raised on rábed seed-beds. The ráb on the last experiment was cowdung ráb, which is undoubtedly the best ráb. In the other two cases it was grass and leaf ráb which is inferior. The inferiority is evidenced largely by the proportion of seed-bed to area of transplantation. On this point the experimenter had to trust to verbal information. He places the area of seed-bed at 5 gunthas per acre of rice in the cowdung ráb and at 6 gunthas in the other. This is very approximate if not quite correct. But I do not quite see how the rate of seed per acre was calculated. The point is not very important. Probably, the rate per guntha in each case was the same. If so, the difference per acre should be greater than that shown by Mr. Pratt. Thus if 12 lbs. per guntha of seed-bed were sown, the acre-rate would, in the case of the leaf and grass ráb, be 60 lbs. and in that of the cowdung ráb 74 lbs.

The yield is affected also by the character of the ráb, but here was another factor—varying quality of land—which, however, does not account for all the difference in the yields.

There is a need for a little more care with the test of the weight of the contents of the local ser. Mr. Pratt found it to be 50, 53, 54½ and 54 tolas, whereas the sample sers weighed in my office showed 47, 51¼, 51¼ and 51¾ tolas, respectively. The tests were, therefore, taken before the grain had been dried. The corrected weights have been recorded in the statement.

Mr. Pratt does not describe the cultivation in detail, because he thinks it would be superfluous to do so in the case of such well-known tillage; but a few remarks as to the cultivation of the salt rice would have been useful. He says the seed was sown broad-cast, "thrown over the field," but if so, the meaning of the item of "transplanting" in the calculation of cost of cultivation is not understood. The cost of cultivation is estimated at Rs. 13-10-0 per acre for the sweet, and Rs. 16-12-0 for the salt rice, but this is not correct.

Mr. Pratt's tests, however, are very good and trustworthy and he has exactly carried out those indicated in the programme for the season.

Ratnagiri.

Mr. W. C. Rand, Assistant Collector.

Mr. Rand has made two experiments—one on harik or kodra (No. 62) and the other on cane. The latter is omitted as it was on an area below the prescribed minimum.

Mr. L. N. Ajgáonkar, District Deputy Collector.

Mr. Ajgáonkar's three experiments (Nos. 63 to 65) are on rice of different varieties—two grown from seedlings raised with ráb and the third from 'ute' or 'roha'—artificially germinated seeds. The superiority of ráb for rice is well shown by comparing the results of the *patni* and *kálisál* varieties. The *panvel* rice was injured by an excessive flood.

The experimenter's report is a little confused. He gives the cost of ráb for the *patni* rice though he distinctly describes the non-ráb cultivation.

The cost of cultivation is very sketchy, for the most important point, *viz.*, the area of seed-bed per acre of rice, is not considered.

Kanara.

Mr. J. Davidson, Assistant Collector.

Mr. Davidson's experiment (No. 66) was on rági, cultivated by hand. The field is cropped at most every other year. The occupant sells the usufruct. The price this year came to Rs. 3-10-2 per acre assessed at Rs. 1-8-6, but the occupant (Local Fund Board) has to pay the assessment yearly and just makes the field pay. The cost of cultivation is estimated at Rs. 17 (manual labour), and the yield at Rs. 34.

NOTE.—In column 3 the date is entered unless not reported by the experimenter.

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	AHMADABAD.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. H. O. Quin, Assistant Collector.										
1	Parántij (Raslod)	Kidney bean, "Math," 12th November.	11	426	23	335	Not given	10 8 0	1 4 7 O. S.	12·25	1 14
	Mr. J. K. N. Kábráji, Assistant Collector.										
2	Dhandhuka (Lodhi)... ...	Wheat Chásia,	16	1,200	51	286	312	10 11 5	1 9 4 R. S.	14·77	0 15
3	Do. (Bhariad)... ...	Cotton Lália, slightly mixed with Vaghária.	12 to 16	420 to 560	8½	235 seed cotton.	Nil ...	12 10 4	1 7 7 R. S.	11·67	0 20
	KAIRA.										
	Mr. H. R. Cooke, the Collector.										
4	Mátar (Chanidra)	Rice (Jiri), irrigated.	16	3,000 (in husk.)	20	3,364 (in husk)	Not reported.	116 9 0	9 8 8 O. S.	8·19	0 2
5	Mátar (Kathvada)	Rice (Kamod), irrigated.	16	3,000 (in husk.)	20	2,687 (in husk)	Do. ...	102 4 8	9 3 8 O. S.	9·02	0 1
	Mr. L. G. Deshmukh, Assistant Collector.										
6	Nadiád (Nadiád)	Tobacco, irrigated, 20th January.	8	2,000	20 Tolas.	1,394	Nil ...	170 0 0	5 11 7 O. S.	3·36	0 4
	Mr. Motilál Chunilál, District Deputy Collector.										
7	Borsad (Pálaj)...	Wheat (Popatia), 26th February.	11	1,100	82	1,107	533	37 0 0	11 9 11 including water-charge. O. S.	31·4	0 10
	PANCH MAHA'LS.										
	Mr. A. F. Maconochie, Assistant Collector.										
8	Kálol (Hálol)	Wheat (Kátha) hard red, 17th March.	8	650	58	820	1,640	34 12 8	1 15 0 O. S.	5·56	0 14
9	Kálol (Wánseti)	Wheat ...	3	244	61	302	606	14 7 8	1 0 6 O. S.	7·11	0 6
		Do. mixed with gram, 22nd March.	...	...	41	90	Nil.				
	Mr. Pránlál Harkisandás, District Deputy Collector.										
10	Dohad (Delsar)	Gram, 27th February.	8	650	112	410	520	8 7 10	2 0 0 R. S.	24·07	0 8
11	Do. (Jalat)	Wheat Vájia, 1st March.	11	1,237	124	416	400	10 9 0	1 12 6 R. S.	16·86	0 10
12	Do. (do.)	Do. ...	11	1,237	192	484	420	12 3 8	2 1 3 R. S.	16·99	0 10
13	Jhálod (Karath)	Do. 9th March.	14	1,575	148	786	793	20 13 0	2 1 3 R. S.	9·98	0 10
14	Do. (Tandi)...	Gram, 10th March.	10	812	88	402	325	8 5 0	1 2 11 R. S.	14·22	0 10
15	Do. (Jhálod)	Wheat Vájia, 12th March.	10	1,125	160	1,336	1,259	34 8 9	3 7 2 R. S.	9·95	0 6
16	Do. (do.)	Gram do. ...	12	975	110	284	325	6 1 1	2 2 9 R. S.	35·79	0 8
17	Do. (do.)	Do. ...	12	975	55	610	513	12 7 7	2 1 1 R. S.	16·57	0 8

Northern Division, 1889-90.

In Column 10, O. S. = Original Survey; R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwt.	
Weight. Ser = 40 tolás.	45⅜	...	Dry-crop unmanured light sandy soil—gorádu—growing math and bájri in rotation. Season only fair. Cultivation indifferent. Crop drilled end of July.
Do.	27⅓	3 nearly.	Dry-crop wheat *chásia* on a medium black soil growing in rotation wheat and cotton. Unmanured. Cultivation good but season under average, late rains being deficient. Value of by-product not taken into account in calculating the incidence in column 11.
Do.	18⅜ seed cotton	...	Cotton alternating with jowári in unirrigated and unmanured, very inferior black soil interspersed with large patches of khár (salt efflorescence). Cultivation good but season with good sowing rains followed by deficient late rains.
Do.	28¾	...	Irrigated and manured rice in kiári or rice-land, growing annually rice followed in favourable years by wheat as a second crop. Seed-bed also manured in May with cattle manure. Cultivation good and season excellent, but the transplantation delayed, first seedlings being eaten by caterpillars. By-product not taken into account in calculating the incidence in column 11. Assessment in column 10 includes water-rate.
Do.	26	...	Ditto. ditto. ditto.
Do.	8⅕ tobacco.	...	Well cultivated gorádu soil growing in rotation bájri and tobacco. Irrigated from a well in the neighbouring field and manured in May at 30 cart-loads of cowdung ashes, leaves and house-sweepings per acre. Season fair but the crop locally estimated at 8 annas.
Do.	32⅘	1½	Garden land in the village site growing two crops, bájri (kharíf) and wheat (rabi). Manured and irrigated from a well. Cultivation good and season favourable. Incidence of column 11 on the second crop only of the season.
Do.	25¾	5	Dry-crop wheat following rice, manured, of the same season. The late rains were deficient but moisture was retained in the embanked rice fields. Cultivation good.
Do.	27 36	5 ...	Wheat and gram sown mixed on land cropped for the first time. Cultivation indifferent and crop very poor, owing to insufficiency of moisture. Both crops cut.
Do.	53	6	The crops are all second crops after maize grown without irrigation. It is noted that the maize crop was manured in Nos. 11 and 12 and apparently it was not manured in the others. The season was poor for the late sown crops and especially so for second crops sown as late as November. The incidence of column 11 is calculated on the yield of the second crop only. No explanation of the comparatively poor yield in Experiment No. 16 is given. The estimate of column 4 should indicate that the crop is a fair one, which it is not. The experimenter, however, considers the cultivation was indifferent in Nos. 10, 16 and 17.
Do.	41	8½	
Do.	41	8½	
Do.	41	4	
Do.	53	3½	
Do.	42	4	
Do.	55	3½	
Do.	55	3½	

NOTE.—In Column 3 the date is entered unless not reported by the experimenter.

No.	DISTRICT, TA'LUKA, VILLAGE AND EXPERIMENTER.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	AVERAGE PER ACRE.						Area of test.
					Seed.	Yield of		Total Value of Product.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	BROACH.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. K. R. Bamanji, Assistant Collector.										
18	A'mod (Chaklád)	Rabi juvár, January.	12	1,200	5½	600	3,124	22 10 2	4 10 10 O. S.	20·68	1 4
	Mr. Chunilal Venilal, District Deputy Collector.										
19	Anklesvar (Anklesvar) ...	Rabi juvár, 24th February.	9	900	8	738	Not stated.	24 8 2	4 1 6 O. S.	16·70	0 6
20	Do. (Hánsot)	Wheat Hansia, 18th February.	14	1,137	60	889	1,267	34 9 10	5 7 4 O. S.	15·76	0 6
	SURAT.										
	Mr. Sayad Nuruddín Khán, Assistant Collector.										
21	Párdi (Sukhes)	Vál, 27th February.	14 to 16	831 to 950	114	1,129	1,290	22 5 3	4 1 1 O. S.	18·21	0 8
22	Do. (Kumbharia)	Castor-oil, 27th February.	9 to 10	337 to 375	38	320	160	16 1 1	0 14 4 O. S.	5·54	0 8
23	Balsár (Sanvada)	Gram, 11th March.	6 to 8	319 to 425	37½	140	223	4 6 7	2 14 5 O. S.	65·78	0 6
	Mr. Umedram Ranchordas, District Deputy Collector.										
24	Olpád (Segwa)	Wheat ...	6	525	12 to 17	573	600	23 4 7	5 1 6 O. S.	21·96	1 10
	THA'NA.										
	Mr. R. M. Kennedy Assistant Collector.										
25	Sálsette (Bándra)	Early rice, (Halve kuttar khi), 30th October.	12	1,600 sweet.	56	2,300 (in husk)	4,750	106 7 9	4 7 1 O. S.	4·17	0 6
26	Bassein (Watar)	Sugarcane 'Red', 8th May.	12	4,000	5,640 canes.	6,650 gul.	471 lbs. (Kákvi) and 440 bundles of toppings.	659 0 7	5 10 6 O. S.	0·85	0 4
	Mr. E. McCallum, Assistant Collector.										
27	Kalyán (Kalyán)	Late rice (Garva Kolumba), 14th November.	15	2,375 (in husk).	50	2,728 (in husk)	5,400	84 11 11	6 0 0 O. S.	7·08	0 14
	Mr. J. M. Cursetji, District Deputy Collector.										
28	Sháhápur (Kalambhe) ...	Late rice, 'Kolambia Garva', 12th November.	11	1,800 (in husk).	35	1,049 (in husk.)	6,573	23 4 10	4 11 5 O. S.	20·23	0 9
29	Dáhánu (Malian)	Laté Rági, 'Nágli Garva', 30th October.	13 to 14	1,360 to 1,440	4	1,391 grain.	352	36 9 9	0 3 9 O. S.	0·64	0 8

Northern Division, 1889-90—continued.

In Column 10, O. S. = Original Survey; R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
Weight. Ser = 39½ tolás.	39½	Not stated.	Black cotton soil. Cultivation good and season fair.
Do. =40	39	Do. ...	Cold weather juvár. Unirrigated but manured by folding sheep for 7 or 8 days last year. Cultivation good, but season indifferent.
Do. =40	31½	2	Unirrigated black soil growing wheat and cotton. Manured in May 1888 for cotton. Rate 40 cart-loads of cowdung the acre. Cultivation good and season fair.
Do. =37	57	4½	Vál as a second crop in rice land manured for the rice. Season and cultivation good. Incidence of column 11 calculated on the second crop only.
Do. ...	20	...	Castor-oil seed on poor soil, growing kodra and castor-oil in alternate years. Cultivation indifferent, but season fair.
Do. ...	32	...	Gram grown on tank land submerged till November. Cultivation indifferent, but season fair.
Do. ...	28	1⅞	Dry-crop wheat, unmanured. Soil locally estimated as "duyam" or medium black. Cultivation good. Season favourable. The figures shown are the average of five tests on 10 guntha plots in one field. The yield varied from 532 to 676 lbs. per acre. The variations are small and point to the correctness of the estimate; but the anna-valuation appears a little low, for the season was not unfavourable for rabi crops. The rate of seeding (column 6) is too low.
111	36⅔	1	Rice raised from rábed seedlings in embanked field of black soil. Field manured before transplantation in July with fish manure. Cultivation good and season excellent. Figures given as returned, but the sample measure, adholi (2 sers), forwarded to this office weighed in April 107 tolas instead of 111 tolas as given by the experimenter in November.
Weight Ser = 28 tolás.	11⅓ (gul.)	Molasses (Kákvi) 18¾ lbs. and 8 bundles of toppings.	High cultivation of sugarcane on the coast, where irrigation from wells available. Cane taken once in three years. Manured with castor-oil cake. Cultivation described as fairly good in comparison with the high local standard.
52	40	2¾	Kolumba rice, a good late variety grown from seedlings raised in rábed seed-bed. The figures are the average of three separate tests taken in the same field. The outturn varied from 2,588—2,890 lbs. per acre in the tests.
52	47⅓	?	Same variety as above, grown from seedlings raised on seed-bed rábed with loppings and grass. Cultivation fair. Season fair. Compared with Mr. McCallum's experiment the yield on poorer land is much smaller. The crop appears to have run to straw.
63	38	...	Varkas land of fair quality requiring two years' fallow after two years' cropping with tág, nágli, kodra, &c. This year nágli raised from rábed seedlings. Cultivation fair and season not unfavourable. Nágli is the best crop by far in the varkas rotation. It is grown from rábed seedlings, but the crops following are unrábed.

Summary of Crop Experiment Reports,

NOTE.—In Column 3 the date is entered unless not reported by the experimenter.

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Averages per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KHA'NDESH.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. A. Lucas, Assistant Collector.										
30	Nandurbár (Nizar)	Wheat ...	10	620	67	372	Not given	13 8 1	1 13 10 O. S.	13·83	0 6
31	Do. (Welda)	Gram... ...	10	435	49	550	Do. ...	20 0 0	1 12 4 O. S.	8·85	0 6
	Mr. W. H. Lucas, Assistant Collector.										
32	Sindkheda (War)	Dry-crop wheat (Bansi), 10th February.	8	350	56	514	640	24 6 0	2 2 6 O. S.	8·84	0 10
	Mr. H. R. Shirhatti, District Deputy Collector.										
33	Dhulia (Dhulia)	Bájri, 14th October.	12	640	16	904	2,096	29 1 4	1 1 5 O. S.	3·74	0 10
	NA'SIK.										
	Mr. W. Doderet, Assistant Collector.										
34	Málegaon (Sangameshvar) ...	Bájri, 27th October.	12	640	5	397	960	12 9 5	2 2 9 O. S.	17·25	0 6
35	Kalvan (Pale)	Wheat, 7th February.	10	500	43	395	715	14 11 0	1 7 3 O. S.	9·90	0 8
	AHMADNAGAR.										
	Mr. R. B. Stewart, Assistant Collector.										
36	Sangamner (Nimbgaon Joli)...	Irrigated wheat (Bakshi), 17th March.	10	840	62	1,783	Not reported.	41 14 10	1 11 1 R. S.	4·03	0 8
	Mr. V. B. Wádekar, District Deputy Collector.										
37	Karjat (Sinde)...	Jowári and Kardai, 7th March.	5 7	180 220	6 3	128 56	487 ...	7 13 0	0 5 1 R. S.	4·12	0 6
	POONA.										
	Mr. E. L. Cappel, Assistant Collector.										
38	Khed (Khed)	Red onions, 2nd May.	14	9,000	13	24,632 or nearly 12 tons.	312	198 12 0	2 2 11 including water-rate. R. S.	1·09	0 4
39	Do. (do.)	Red onions, 3rd May.	14	9,000	10	28,841 or nearly 13 tons.	...	231 4 0	3 0 0 R. S.	1·29	0 4

Central Division, 1889-90.

In Column 10, O. S. = Original Survey ; R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
134	29¼	Not given.	Dry-crop wheat. Season not favourable. Unmanured. Incidence calculated on outturn of grain only. The chaff is valuable.
137	28	Do.	Do. do. The by-products of gram are even more valuable than those of wheat, yet are not taken into account.
136½	28	1	Drilled in November. Rotation wheat and cotton. Land manured lightly, about 13 loads to the acre, once in three years. No irrigation. Land good black. Season unfavourable for rabi crop owing to scant rainfall. Crop sown late, but ripening early. Much burnt and stunted.
146	33⅓	8⅓	Dry-crop bájri sown alone on medium black soil growing in alternate years bájri and cotton. Manured (about 7 cart-loads the acre) in May. Field rather weedy. Season favourable for bájri in such lands.
144	43	2½	Bájri sown alone on unmanured land, rated highly, growing bájri continuously. Season fair. Good sowing rain, but deficient moisture in August. Cultivation average. The land was twice ploughed. But the crop was not watched and a high yield cannot be expected without some rotation. Mr. Docteret thinks the estimate of column 4 too high. His estimate was 10 annas.
140	28⅔	6¾	Dry-crop unmanured red wheat alternating with bájri in black soil. Cultivation good, but season below average for rabi crop. A fair average for the season, but the assessment and rotation show that the land is light for wheat.
114¼	44	Not given.	Irrigated Bakshi wheat on land assessed at dry-crop rates. There is no water charge ; hence the percentage of column 11 is very low. The irrigation is from a private well. Land manured, 10 cart-loads per acre, in June. No reason is shown for the low estimate of column 4. Scanty rainfall there was, but the crop was a watered one.
107	38⅔	1¼	Test of the common mixture of jowári and Kardai (Carthamus tinctorius) sown in rows, 6 of jowári to 2 of Kardai. The land was unmanured and of very poor quality. The season was unfavourable to late crops on such light land.
82	42	...	
weight ser=76 tolás.	124⅔ bulbs.	...	Pátasthal irrigation, supplemented by well. Manure 17 cart-loads per acre. Land growing bájri as rain crop with potatoes or onions in the rabi season. High market-garden cultivation. The formulæ yield appears to have been based on insufficient information. The seedlings were raised in a nursery and transplanted in September. Crop dug.
Do.	Do.	...	As above, but no pátasthal, soil deeper. Transplanted in October. Crop pulled and so by-product, *i.e.*, damaged bulbs not in appreciable quantity as in the experiment above.

NOTE.—In Column 3 the date is entered unless not reported by the experimenter.

No.	DISTRICT, TÁLUKA, VILLAGE AND EXPERIMENTER.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	AVERAGE PER ACRE.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	SHOLA'PUR.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. A. C. Logan, Assistant Collector.										
40	Sholápur (Sholápur)	Irrigated Khapli wheat (Triticum speltum), March.	14	1,620	126 (in husk.)	1,738 (husked)	2,800	63 12 0	1 0 0 R. S.	1·56	0 10
	SA'TA'RA.										
	Mr. G. D. Párse, Assistant Collector.										
41	Válva (Yelur)	Sugarcane, 30th January.	14	5,400	6,400 sets.	7,466 (gul.)	Not stated.	379 2 8	3 13 3 O. S.	1·01	0 6
42	Do. (do.)	Groundnut, 30th January	12	3,200	32	2,440 (unhusked.)	Do. ...	53 6 0	4 0 0 O. S.	7·49	0 12
	Mr. G. W. Scott, District Deputy Collector.										
43	Khánápur (Kadegaon) ...	Jowári(Dukri), 9th January	6	280	6	349	526	15 7 7	2 12 10 O. S.	18·10	1 37

Central Division, 1889-90—continued.

In Column 10, O. S. = Original Survey ; R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product	
13	14	15	16
	Lbs.	Cwts.	
143	33	Valueless.	Khapli or Jod wheat irrigated with well water on manured land assessed at dry-crop rates, within the limits of the Sholápur Municipality, sown broad-cast. The yield is that of wheat separated from the husk which in this variety is persistent, but the seed was in husk. Wheat is the second crop after Kadval or hot weather jowári sown before the monsoon.
Weight ser=2 lbs.	19⅔ gul.	...	Cane of the striped variety in well irrigated land assessed at garden rates ; manured with about 25 cart-loads per acre. Cultivation excellent. The crop was not considered quite a full crop because the rains were deficient and the water-supply from the well was a little scanty. Cane is here a 12-month crop, sown and reaped in January and is followed by groundnut.
Do. ...	45⅘ unhusked nuts	...	Groundnut on lightly manured land following manured cane. The land is assessed as bágáyat and is watered from a well. Sown in June. Watered in August and September. The yield is for unhusked groundnut. Cultivation excellent.
110	33⅓	1	Jowári once watered from a "pát" or channel on land assessed as dry-crop. Manure 8 cart-loads per acre. Season poor. The rain was insufficient and untimely. The land grows groundnut in rotation with jowári.

NOTE.—In Column 3 the date is entered unless not reported by the experimenter.

No.	DISTRICT, TA'LU'KA, VILLAGE AND EXPERIMENTER.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	AVERAGE PER ACRE.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	BELGAUM.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. W. D. Sheppard, Assistant Collector.										
44	Belgaum (Chandgad)... ...	Rice 'Somsál,' 17th November.	15	3,800 (in husk).	155	2,662 (in husk)	2,480	60 13 4	2 6 5 R. S.	4·35	0 5
45	Do. (Mádoli)	Rice 'Chicklya,' 27th November.	16	2,000 (in husk).	123	2,077 (in husk)	2,360	47 11 9	4 10 8 R. S.	9·77	0 8
	Mr. Gursidápa Virbasápa, District Deputy Collector.										
46	Chikodi, Hukeri Peta (Nada Hattargi).	Jowari 'Gunda' or Round and 'Shedgar' or Flat, 6th December.	12	1,120	3¼	590	2,277	21 8 5	1 14 8 R. S.	8·92	0 12
47	Do. (do.)	Do. 6th December.	6	200	3⅛	122	464	4 6 7	0 13 0 R. S.	18·46	0 24
	DHA'RWA'R.										
	Mr. Palmer Wiltshire, Assistant Collector.										
48	Hubli (Keshwápur)	Cotton (Indigenous), 8th March.	10	250 seed cotton	5	160 seed cotton, first picking.	...	11 2 4	2 14 6 R. S.	...	0 10
49	Dhárwár (Tadakod)	Sugarcane, 5th May.	8	2,100 (gul).	9,000 sets.	4,870 (gul).	9,520	241 4 0	10 7 0 R. S.	4·32	0 4
	Mr. Sorábji Padamji, Assistant Collector.										
50	Bankápur (Náráyanpur) ...	Early jowari and tur, 15th December	10	745	Jowari 4½ Tur 13⅓	807 134	3,004 48	33 8 0 3 9 0	1 11 6 R. S.	4·63	0 10
								37 1 0			
51	Karajgi (Karajgi)	Unirrigated chillies, 8th January.	8	2,100	tolas 8	644	...	24 0 0	1 9 9 R. S.	6·70	0 10
	Mr. R. E. Kánga, District Deputy Collector.										
52	Ron (Ron)	Exotic cotton, 'Bilayti,' 6th April.	6	80 seed cotton	7	60 seed cotton.	...	4 2 10	0 14 8 R. S.	21·96	1 0
53	Do. do.	Wheat, 5th February.	10	620	43	385	412	10 12 0	0 14 1 Do.	8·22	0 10
54	Do. do.	White jowári, 29th March.	8	490	3	478	1,234	18 9 4	0 14 1 Do.	4·75	1 0
55	Do. do.	Safflower, 30th March.	8	350	30	498	...	11 10 8	0 14 1 Do.	7·58	0 12
56	Do. do.	Linseed, 22nd March.	6	100	18	84	...	3 6 0	0 14 1 Do.	26·20	2 8
57	Navalgund (Navalgund) ...	Gram, 9th March.	9	350	15½	318	208	9 8 0	0 15 0 Do.	9·95	0 10

Southern Division, 1889-90.

In Column 10, O. S. = Original Survey; R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
59	48½	3⅘	Continuous rice grown from seedlings raised on a cowdung-rábed seed-bed. The rab was burnt in May. Soil red, growing no second crop. Season good. Entry in column 6 doubtful.
60	48	3⅘	Continuous rice in a valley retaining moisture, but the seed was not first sown in a seed-bed and then transplanted, but drilled in the field in which it grew to maturity. Field manured immediately after sowing. Apparently no second crop was taken, but the rate of assessment and the position of the land point to the possibility of a second crop of pulses.
80	41	3	Early jowári on a pure black soil growing jowári, navni, gram, cotton, tur, mug, kulthi and chillies; manured in May at 4 cart-loads the acre of cowdung manure mixed with ashes. Cultivation good, but season not favourable.
80	41	3	Unmanured jowári on a hard red soil growing jowári and tur every year. Cultivation indifferent, and the crop very poor.
Weight. Ser = 20 tolás.	14⅛ seed cotton.	...	Cotton on land manured with cowdung and by folding sheep. Only the value of the first picking is shown. Column 11 is therefore left blank.
Do. ...	20½ Gul.	?	Column 10 shows the survey assessment plus the charge (Rs. 1-7-0 per acre) for water from Government tank. The manure applied is said to be worth only Rs. 10 per acre, viz., 13 cart-loads, an unusually small dressing for cane.
163	66⅘ jowári 41¾ tur.	1¼	Black soil growing in alternate years cotton and jowári mixed with tur; lightly manured. Cultivation good and season fair. Seven rows of jowári to one of tur, *i. e.*, drilled with a 4-coulter drill, sowing tur in one tube every other turn.
Weight. Ser = 20 tolás.	26⅘ Dry chillies.	...	Rotation: 1 jowári and mug, 2 navani (Italian millet), 3 jowari with an occasional dry-crop of chillies. Soil red, on river bank, unmanured. Cultivation good, but a portion of the crop washed away by the inundation of the river. The chilli seedlings are reared in a seed-bed and transplanted.
Do. ...	14⅖ ungin-ned cotton	...	Cotton on black soil and alternating with jowári or wheat; manured by folding 800 sheep for 4 days in the field (16 acres, 14 gunthás) in July. Cultivation fair and season favourable at first, but it was injured by unseasonable weather afterwards, and after the first picking was done, it is reported that heavy rain prevented further pickings, which are often as many as three. Column 11 is calculated on the yield of the first picking alone.
169	44 grain.	1¾	Crop mixed with rows of safflower, 8 of wheat to 1 of safflower. Actual area of column 12 was 11¼ g.=10 g. wheat. Black soil, unirrigable. Manured. Season fair.
156	47	2	Same field. Late jowári sown with rows of gram and linseed. Six rows of former to one of each of latter. Season fair. Manured by folding sheep. Actual area of test 53 g. = 40 g. of jowári.
122	42¾	..	Row-crop on same field. Area under safflower in field estimated at 12 gunthas and whole area cut; a system not to be followed, though justified here for purposes of special experiment.
134	37¾	1¼	Same field. Area similary estimated. Tests Nos. 52—57 made for a special experiment.
155	39¾	1¾	Gram as a row-crop with jowári. Three rows of jowári to one of gram with linseed around the borders. The yield for columns 7 and 8 on an acre of gram alone would be four times the amount recorded.

NOTE.—In Column 3 the date is entered unless not reported by the experimenter.

No.	DISTRICT, TA'LUKA, VILLAGE AND EXPERIMENTER.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	AVERAGE PER ACRE.						Area of test.
					Seed.	Yield of		Total value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	KOLÁBA. *Mr. E. M. Pratt, Assistant Collector.*										
58	Panvel (Gawhan)	Rice (Rata), 1st November.	6	200 (in husk.)	50	245 (in husk)	304	4 14 0	2 6 0 O. S.	48·70	0 10
59	Do.	Rice (Dodki), 1st November.	10	1,550 Do.	63	1,125 Do.	2,153	28 13 8	2 12 3 O. S.	9·59	0 12
60	Do. (Owleh)	Rice (Dodki), 2nd November.	10	1,550 Do.	63	1,132 Do.	1,878	27 8 10	2 7 5 O. S.	8·93	0 11½
61	Do. (do.)	Rice (Dodki), 9th November.	14	2,250 Do.	60	2,253 Do.	3,416	53 15 0	4 4 0 O. S.	7·88	0 10
	RATNAGIRI. *Mr. W. C. Rand, Assistant Collector.*										
62	Vengurla (Vengurla)	Harik, 5th November.	6	160	32	323 grain.	Not stated.	5 4 4	0 2 8 O. S.	3·12	0 6⅔
	Mr. L. N. Ajgaonkar, District Deputy Collector.										
63	Ratnágiri (Pokshi)	Rice (Patni), 26th October.	11	1,440 (in husk.)	98	863 (in husk)	1,220	24 1 5	3 0 4 O. S.	12·53	0 8
64	Sangameshvar (Turchuri) ...	Rice (Panvel), 27th October.	12	1,800 Do.	82	1,250 Do.	3,320	39 8 6	5 15 0 O. S.	15·02	0 4
65	Do. (Ambedon) ...	Rice (Kálisál), 28th October.	14	2,250 Do.	54	2,367 Do.	4,432	73 7 8	6 1 9 O. S.	8·31	0 10
	KA'NARA. *Mr. J. Davidson, Assistant Collector.*										
66	Kumpta (Diogi)	Rági, 17th November.	15	1,425	3	1,783	Not reported.	34 8 4	1 8 6 O. S.	4·43	0 10

Southern Division, 1889-90—continued.

In Column 10, O. S. = Original Survey; R. S. = Revision Survey.

Equivalent in tolás of Local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
47 in husk.	61½	2¾	Continuous rice on Khárápát or salt rice land. Sown broad-cast. Cultivation bad, as salt water had been let in by inattention to the protecting dykes, and recently the whole area has been flooded with sea water. Variety of rice a poor early one.
51¼ in husk.	52¼	Do.	Continuous rice on salt batty land in an advanced stage of reclamation. Seedlings raised in rábed seed-bed. Ráb of leaves and grass. Cultivation good and season favourable.
51¼ in husk.	53⅛	Do.	Continuous rice on new rice land, *i.e.*, Varkas land converted into rice land and of short depth. Seedlings reared in seed-bed, rábed with grass and leaves. Cultivation good and season favourable.
51¾ in husk.	53⅛	Do.	Continuous rice on good rice land of full depth, capable of growing the better kinds of late (Garwa) rice, but actually growing a somewhat inferior variety. Seedlings reared in seed-bed, rábed with cowdung and straw. Cultivation good and season favourable. This land can and does grow a "Dusota" or late crop of pulses after rice.
49¼	Not given.		A late sown crop on *varkas* land growing for three years 1 kulith, 2 náchni and 3 harik, followed by a fallow of two years. Harik is the poorest crop in the rotation. Season favourable, but the lateness of the sowing owing to occupants being occupied on better lands reduces the crop to a 6-anna one.
47¾	40½	4	Rice sown broad-cast, the seed having been caused to germinate artificially before sowing. This seed is locally called 'roha.' This system of cultivation is a makeshift when ráb cannot be procured.
46	39	4	Rice raised from rábed seedlings, but the crop was injured by the flooding of the river.
44	37	4	Rábed rice. Well cultivated. Season favourable.
33½	54	...	Rági cultivated by manual labour and sown broad-cast, not transplanted, though blanks were filled up by seedlings brought from outside. Rotation crop with alternate fallow; the crop being always rági, and the fallows irregular, but at least every other year. Season good. No manure put on, but the land is close to the village site.

APPENDIX A.

Details of Special Crop Experiment conducted by Mr. W. Doderet, Assistant Collector, Násik, in Kalvan táluka, Násik District (referred to on page 11).

The crop experimented on was a very fair average one for central Kalvan, where the wheat this year suffered from want of cold weather showers. The wheat further west was better by an average of 2 or 3 annas. The marginal rough sketch (omitted) shows the patches selected for cutting. The whole field measures 11 acres 8 gunthas, 11 acres cultivated and 8 gunthas occupied by a road. The field is divided into two equal strips, the right hand strip having passed into the possession of a Shimpi money-lender. Thus 5 acres 20 gunthás are left with the khátedár, Sakhárám Kálu Deshmukh, of which 4 acres were sown with wheat and 1 acre 20 gunthás at the south side with jowári. The jowári had already been cut at the date of my experiment. The yield of the jowári was said to be 3 pailis (=12 seers) only, worth Re. 1 and Rs. 2 for the kadba. The season has been a bad one almost throughout my charge for rabi dry-crop jowári, and in addition to this factor as affecting the yield, a 'sánd' or holy bull was allowed to get into the jowári field and do some considerable damage. All the operations of reaping, threshing, winnowing, weighing and measuring the wheat selected for experiment, were carried out under my own personal supervision, agreeably to standing orders.

The following table shows the cost of cultivating one acre of dry-crop wheat on the assumption that the whole of the labour of both men and animals was paid for. No hand-weeding or bullock-hoeing was done:—

Table showing Cost of Cultivation of 4 Acres of Wheat.

Operation.	Men at 3 annas.	Days at 8 hours.	Cost.	Bullocks at 3 annas.	Days at 8 hours.	Cost.	Total Cost.	Remarks.
			Rs. a. p.			Rs. a. p.	Rs. a. p.	
2 ploughings	2	4	1 8 0	4	4	3 0 0	4 8 0	Household labour.
2 Harrowings	2	4	1 8 0	4	4	3 0 0	4 8 0	Do.
Smoothing ground with "phalli".	1	½	0 1 6	4	½	0 6 0	0 7 6	Do.
Sowing	2	2	0 12 0	4	2	1 8 0	2 4 0	Do.
Reaping and binding ...	9	2½	8 10 0 (Actual cost).	...	...	..	8 10 0	4 hired labourers.
Carrying home crop ...	1	1	0 3 0	2	1	0 6 0	0 9 0	Household labour.
Threshing	4	1	0 12 0	14	1	2 10 0	3 6 0	2 men and 10 bullocks hired.
Winnowing and cleaning.	6	1	1 2 0	...	...	...	1 2 0	1 hired labourer.
Cost of seed	...	...	.....	...	...	...	6 0 0	Actually paid for.
						Total Rs. ...	31 6 6	
						Average per Acre ...	7 13 7	
						Add—Baluta ...	0 9 4	
						Add—Local Fund ...	0 1 5	
							8 8 4	

NOTE.—2 bullocks belong to the khátedár and 2 to his cousin, who cultivates with him and shares the profits and expenses equally. Khátedár, his wife and mother, cousin and cousin's wife work in the field.

As regards the reaping, the practice is to give each labourer 5 per cent. of the sheaves. In ¼ acre experimented on there were 46 sheaves ∴ in 4 acres 920 sheaves. I timed 8 men reaping and one binding to do ¼ acre in one hour. Taking the working day at 8 hours (8 A.M. to 12 noon and 2 to 6 P.M.) it would thus take 9 men 20 hours to reap and bind the produce of 4 acres, that is, 2½ working days. Now if 920 sheaves were the produce of 4 acres the percentage given to the reapers would be 46 sheaves, at 3 annas, or Rs. 8-10, so each reaper makes about 6 annas a day. Hence the arrangement is much to the advantage of the reaper.

As regards the calculation of baluta, the khátedár stated he pays in all 107 sers of grain on the farm. He has 20 acres 7 gunthas under cultivation and this works out to about 5⅓ sers per acre. The balutedárs are paid in wheat and bájri half and half. Wheat being Rs. 8 and bájri Rs. 6 per maund of 64 sers, the average ser of grain is worth 1 anna 9 pies. Hence, the money value of the baluta per acre is 9 annas 4 pies.

The khátedár cultivated in addition to the 4 acres of wheat experimented on the following :—9 acres 11 gunthas of wheat, 3 acres 16 gunthas of kulith, 2 acres of bájri and 1 acre 20 gunthas of dádar (jowári). This wheat was of the same anna-value as the field experimented on.

First take the wheat and calculate the *outside* labour as follows :—

		Rs.	a.	p.
(4 acres)	Reaping, 4 men at 6 annas per day for 2½ days ...	3	12	0
	Threshing, 2 men at 3 annas and 10 bullocks at 3 annas per day for one day	2	4	0
	1 man to winnow at 3 annas per day	0	3	0
		6	3	0
	Add cost of seed ...	6	0	0
	Total ...	12	3	0
	Therefore average per acre	3	0	9
	Therefore cost on 13 acres 11 gunthás ...	40	7	1

Next the kulith : the only operation that was paid for was the reaping, which cost Rs. 2 on 3 acres 16 gunthas and Rs. 1-2-0 was paid for seed. Total Rs. 3-2-0.

Next the bájri : the cost on 2 acres is given as follows :—

	Rs.	a.	p.
Reaping	1	2	0
Threshing	1	2	0
Winnowing	0	3	0
Cost of seed	0	6	0
Total ...	2	13	0

Lastly the dádar : the only expenditure was on seed 6 annas : the other operations were performed by household labour. Therefore the total cost of out-door labour, plus seed, was as follows :—

	Rs.	a.	p.
Wheat	40	7	1
Kulith	3	2	0
Bájri	2	13	0
Dádar	0	6	0
Total ...	46	12	1
Add baluta on the farm	11	11	3
Add kulith bought for bullocks to feed them for 3 months in the rains	4	8	0
Add replacement of live-stock (a pair of bullocks at Rs. 50 lasted 10 years)	5	0	0
Add wear and tear (1 cart at Rs. 40 lasted 20 years. Sutár has to replace ploughs out of baluta)	2	0	0
Total ...	69	15	4

Next to calculate the yield of the whole holding :—

	Rs.	a.	p.
From 13 acres 11 gunthas of wheat at an average of Rs. 14-11 per acre (*see* column 29) money value of grain and by-products	194	15	7

	Rs.	a.	p.
From 2 acres of bájri which was a 12-anna crop (*see* columns 19 and 21 of experiment No. 1 of this year) money-value of grain and straw	23	8	8
From 3 acres 16 gunthas of kulith (a 12-anna crop) yield according to khátedár's statement 6⅘ maunds of grain at Rs 4-8 per maund	30	9	7
And 2 cart-loads of kulith fodder at Rs. 2 per cart-load ...	4	0	0
From 1 acre 20 gunthás of dádar grain 3 páilis (= 12 sers)...	1	0	0
Kadba from ditto	2	0	0
Grand Total ...	256	1	10

Deduct from this Rs. 69-15-4 as shown above for expenses of cultivation and we get Rs. 186-2-6. Now the khátedár cultivates jointly with his cousin, who lives separately and they share the expenses of cultivation and divide the net produce, therefore balance with khátedár, Rs. 93-1-3. He subsists entirely on the produce of his field: does not ply his cart for hire or work for hire. The khátedár supports his mother, wife and one small child. There is an infant at the breast, which costs nothing.

Calculating 1½ lbs. per adult and ½ lb. for the small child or 5 lbs. per diem we get for the year 1,825 lbs. Bájri is the staple food and about 40 lbs. can be procured for one rupee, therefore cost of food Rs. 45-10-0.

Deduct this from Rs. 93-1-3. We get a balance of Rs. 47-7-3.

Then there are annual cash expenses as follows :—

		Rs.	a.	p.
Purchase of condiments	For self.	6	0	0
Do. do. oil.	For self.	6	0	0
4 'Panchas'	For self.	2	0	0
3 'Bandis' (shirts)	For self.	1	8	0
1 Turban (1 in 3 years, costing Rs. 3)	For self.	1	0	0
1 Blanket	For self.	1	4	0
One pair shoes	For self.	1	4	0
'Khádi' cloth	For self.	2	2	0
4 'Lugdies'	For two women.	10	0	0
8 'Cholies' (bodices)	For two women.	3	0	0
2 'Phadkies'	For two women.	1	0	0
3 Dresses for child	For two women.	1	4	0
Total ...		36	6	0

Deducting this from Rs. 47-7-3 there remains the sum of Rs. 11-1-3. Out of this the khátedár pays his share of the assessment and Local Funds which comes to Rs. 9-10-0 and he has a rupee or two left to spend on liquor and "pán supári" and has to pay 3 annas annual grazing fee for his cow.

Thus the net result of the experiment goes to show that in a year in which rabi crops were generally rather below the average a small family can still manage to exist with comfort and keep out of debt. The khátedár bears out the calculations by stating that he is not in debt. The principal product of the farm being wheat, another two annas on the yield of wheat would have raised the yield by $\frac{1}{5}$th or a money-valuation of Rs. 40 about. It is the custom in central Kalvan not to rely on the outturn of one crop only. Hence it was impossible to get a kháta with wheat only. The one selected has about 65 per cent. of wheat. For the calculation of the bájri, I have used my experiment in Málegaon and for the kulith and dádar I had to rely on the khátedar's statements, which were borne out by the Pátil and Kulkarni and independent enquiries made through the Mámlatdár. The bájri, kulith and dádar had been cut and carried home at the date of my experiment. To calculate the incidence for columns 33, household labour is to be omitted (*vide* instructions in Appendix A, Crop Experiment Report of 1887-88).

The gross produce of the holding is worth Rs. 256-1-10 and Rs. 69-15-4 represents the cost of out-door labour plus baluta, cost of seed, wear and tear and replacement of live-stock, Rs. 185-0-5 therefore represents the net produce of the holding after deducting Rs. 1-2-1 for Local Funds. The average net produce per acre is therefore Rs. 9-2-8.

The total assessment and judi on the holding is Rs. 18-2-0 (three numbers being Inám) which gives an average assessment of 14 annas 4 pies per acre, therefore the incidence per acre on the whole farm is 10·2*.

In conclusion it is necessary to add that the live-stock are fed during the slack season on the produce of the holding, such as kadba and bhusa of all the crops mixed together and ground down, a product called 'kutar'. During the rains they subsist on the grass grown along the banks of the fields, and kulith is given them for 3 months while field operations are in progress, and further, in the year that bájri forms the chief product of the holding, a large quantity of straw is obtained and it is much more valuable than wheat straw and lasts much longer, even into the next year. No fodder is purchased. It is difficult under these circumstances to arrive at reliable conclusions as to how much should be deducted for fodder. The 'kutar' is never sold and has no marketable value. The khátedár estimated it at worth Rs. 16 on the whole holding. I think about Rs. 20 a fair estimate and thus Rs. 10 would have to be deducted from the share of the net produce to go to the khátedár which would leave him with hardly any balance to pay the assessment. However the fact remains he does pay the assessment out of the produce of the holding and is not in debt and he would easily make up the difference by selling his wheat (for he lives on bájri) at 7 sers instead of 8 sers per rupee later on when prices get tighter, which would give him Rs. 12 more than I have credited him with.

* The correct figure is 9·7.

APPENDIX B.

Cost of Cultivation for General Guidance of Experimenters.

[Notes taken from the Cultivation Book, Bhadgaon Farm, 1889-90.]

Survey No. 85; area 14 acres 2 gunthás; assessment original survey Rs. 26-8-0.

Soil, good deep black cotton soil.

Season of low but well distributed rainfall for cotton and other kharíf crops, but very scanty for rabi crops, not sown in the very commencement of the rabi season.

Manure.—The land has not been manured since 1881-82 nor irrigated since that year, except to save a crop of gram in 1888-89.

Charges made for labour—

Man 3 annas, woman 1½ annas, boy 9 pies.

Pair of bullocks, 5 annas per diem.

The field has 12 acres 36 gunthas of cultivable land, the rest being occupied by spaces between the plots, and is divided into 12 regular one-acre plots. The balance area forms an irreguar plot.

Previous cropping ... { 1886-87 jowári. 1887-88 cotton and tur. 1888-89 gram, irrigated but unmanured.

Cropping in 1889-90—

Jowári (kharíf) 2 plots; linseed 3 plots; dry wheat 2 plots; gram 1 plot; cotton 4 plots, one of acclimatized American, one of indigenous Khándesh and two of Berár cotton, Jari and Bani.

Preparation of field.

The field was fairly clean and so no hot weather ploughing was required for cleaning :—

	Rs.	a.	p.
June 2nd-8th—Ploughed with 2 bullock plough at rate of about ½ acre per day...	13	12	0
Gathering weeds (kunda) brought up by the plough. One woman followed each plough	2	9	3
Cleaning borders, burning weeds, &c.	0	15	3
For 12 acres 36 gunthas... ...	17	4	6

=Per acre Rs. 1-5-5.

Jowári plots per acre.

Preparatory cultivation as above	1	5	5
17th June—Harrowing 2 acres a day	0	4	0
8th July Do. 1½ do.	0	6	0
Do. Drilling seed 2 acres a day	0	4	0
Do. Covering seed 4 do.	0	2	0
Cost of 5 lbs. seed at 38 lbs. per rupee ...	0	2	1
27th July—Bullock-hoeing. Double hoe worked by a man and a boy and 1 pair of cattle 2 acres a day ...	0	4	6
19th August—Do. a little less than 2 acres a day ...	0	5	6
22nd do. Hand-weeding by piece-work	0	12	0
9th October to 29th November } Watching 51½ days. 1 man for 2 acres. (He could have watched a much larger area)...	4	13	3
30th November—Pulling crop by piece-work	0	4	0
13th December—Cutting ears do.	0	8	0
Carting ears to threshing floor ...	0	7	0
31st December—Tying bundles of kadbi (piece-work) ...	0	5	0
1st January—Stacking kadbi	0	4	3
17th May—Treading out the corn (1,134 lbs.) and winnowing	1	5	0
	11	12	0

Note.—On the duplicate plot the yield being slightly greater (1,487½ lbs.) the cost was Rs. 12-5.

Linseed plots per acre.

	Rs.	a.	p.
Preparatory charges as above	1	5	5
8th July—Harrowing 1½ acres a day	0	6	0
22nd do. Do. do.	0	6	0
22nd September Do. do.	0	6	0
8th October Do. do.	0	6	0
10th do. Drilling seed and harrowing to cover seed } 1½ acres a day ...	0	12	0
Cost of 8 lbs. seed at 20 lbs. per rupee ...	0	6	4
3rd February—Harvesting (piece-work)	0	8	0
Do. Carting crop	0	5	6
2nd March—Treading out, winnowing and cleaning (414 lbs.)	1	12	0
	6	9	3

Note.—The yields on the other plots were very similar, but in them tili (sesamum) was first sown. The tili failed and was harrowed in and the plots resown with linseed. This raised the cost to Rs. 8-4-0 per acre on these plots.

Dry-crop wheat per acre.

	Rs.	a.	p.
Preparatory charges as above	1	5	5
8th July—Harrowing 1½ acres a day	0	6	0
21st August Do. 2 do.	0	4	0
22nd September—Harrowing 1½ acres a day	0	6	0
9th October Do. do.	0	6	0
11th do. Sowing by drill followed by harrow to cover seed 1½ acres a day	0	12	0
Cost of 60 lbs. seed at 28 lbs. per rupee ...	2	2	3
11th February—Harvesting (piece-work)	0	8	0
Carting...	0	8	4
1st April—Treading out and winnowing (413 lbs.) ...	2	6	0
	9	0	0

Note.—The numerous harrowings for the rabi crops were necessitated by the growth of weeds.

Gram plot per acre.

	Rs.	a.	p.
Preparatory charges as above	1	5	5
8th July—Harrowing 1½ acres a day	0	6	0
24th August Do. do.	0	6	0
22nd September Do. do.	0	6	0
8th October Do. do.	0	6	0
9th October—Sowing by drill followed by harrow to cover seed 1½ acres a day	0	12	0
Cost of 35 lbs. of seed at 34 lbs. per rupee ...	1	0	7
23rd January—Harvesting (piece-work)	0	8	0
24th January—Carting	0	6	0
6th March—Beating and treading out and winnowing (793 lbs.)	1	10	0
	7	2	0

Cotton plots per acre.

	Rs.	a.	p.
Preparatory charges as above	1	5	5
16th June—Harrowing 2 acres a day	0	4	0
19th do. Sowing 1 man and pair of bullocks and one woman with seed tube 2 acres a day ...	0	4	9
,, Covering seed 2 acres a day	0	4	0
,, Cost of 15 lbs. seed at 60 lbs. per rupee ...	0	4	0
23rd July—Bullock-hoeing. Double hoe 3 acres a day ...	0	3	8
4th August—Hand-weeding (piece-work)	0	8	0
3rd do. Bullock-hoeing 1¼ acres a day	0	8	3
27th do. Do. (single hoe) 1 acre a day ...	0	8	0
10-16th December—1st picking 1 anna per 16 lbs. ...	0	14	9
2nd do. 1 do. 9 lbs. ...	0	1	2
16th January—Ginning at 8½ annas per 100 lbs. ...	1	5	0
	6	7	0

Note.—The cost varies with the crop. Picking cost 1 anna per 16 lbs. seed cotton early, but 1 anna per 9 lbs. late in the season when labour was more scarce and the crop thinner.

Abstract per acre.

	Cost of cultivation.	Value of yield.	Yield.	
			Principal product.	By-product.
	Rs. a. p.	Rs. a. p.	Lbs.	Lbs.
Jowár	11 12 0	35 4 0	1,134	2,500
Linseed	6 9 3	20 10 0	414	100
Wheat	9 0 0	18 0 0	413	1,200
Gram	7 2 0	22 2 0	793	300
Cotton	6 7 0	20 0 0	248 Seed cotton.	...

All these crops were very good, especially jowári. Wheat only was a poor crop, but as it was early sown it was far above the average of the season. The figures for cotton are those for Hinganghát Bani. The figures for all varieties were:—

Variety.	Cost of cultivation.	Yield seed cotton.	Value.
	Rs. a. p.	Lbs.	Rs. a. p.
Hinganghát Jari	5 5 0	96	8 0 0
Acclimatized American (Dhárwár)	5 4 6	153	12 5 6
Indigenous Khándesh (Varádi)	6 1 0	229	18 7 6
Hinganghát Bani	6 7 0	248	20 0 0

Note.—The jari cotton costs proportionately more to pick than the others.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1890-91.

[Price 6 Annas.]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1890-91.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

B 528—a

CONTENTS.

	Pages.
I.—Forwarding Letter	1—2
II.—Analysis—	
Northern Division	3—12
Central Division	13—21
Southern Division	22—29
III.—Tabular Statements—	
Northern Division	30—35
Central Division	36—39
Southern Division	40—43
IV.—Appendix—	
Note on Sugarcane Cultivation at Mundhwa, Poona District, by Mr. J. W. Mollison	44—47

No. 2151 of 1892.

From

E. L. CAPPEL, Esquire, C. S.,

Director, Land Records and Agriculture, Bombay;

To

The CHIEF SECRETARY to GOVERNMENT,

Revenue Department, Bombay.

Poona, 30th July 1892.

Sir,

I have the honour to submit the analysis of Crop Experiments for the year 1890-91.

2. The number of experiments reported is as follows :—

Division.	1889-90.	1890-91.			Increase or Decrease.
		Reported.	Rejected.	Total.	
Northern Division	35	30	2	32	— 3
Central Division	22	20	4	24	+ 2
Southern Division	24	20	2	22	— 2
Total ...	81	70	8	78	— 3

The reasons for rejection are in each case given as usual in the analysis. The decrease in the total number of experiments is mainly attributable to the pressure of Census duties. Only one special experiment by Mr. Vádekar is reported.

3. The programme laid down by Mr. Ozanne in consultation with Collectors has been better adhered to than that of 1889-90. The marginal table shows the number of tests carried out on each staple. The ground-nut and sugarcane experiments are specially valuable and a good deal of new information has been recorded from Mr. Ajgaonkar's account of the cultivation of hill-grains in Ratnágiri. Mixed crops have also secured a fair share of attention, and the continuance of these experiments will before long solve most of the difficult problems arising from mixed cultivation. Two tests on tank numbers in Surat and a rice test in Kaira were specially asked for and are most useful. The season was unfortunately unfavourable to oilseeds and the experiments are not as valuable as they might otherwise have been. Italian millet, chillies and coriander require more attention. The general programme for 1891-92 has been laid down on the same lines as that for the year under report, as this requires supplementary experiment throughout.

Crop.	Tests.
Sugarcane	7
Oilseeds	16
Mixed crops...	11
Rice	12
Wheat	7
Harik, nágli, &c., hill-grains ..	11
Pulses	7
Cotton	3
Jowári	2
Patáto	1
Maize	1
Total ...	78

4. The officers who have submitted reports specially worthy of commendation are :—

Northern Division	...	... Messrs. Weir, Batchelor, Syad Nuruddin Khán, and Orr.
Central Division...	...	... Messrs. Lucas, Vádekar, Mollison, Arthur, Doderet, and Pánse.
Southern Division	...	... Messrs. Pratt, Hudson, Kánga and Ajgaonkar.

5. The importance of these experiments has been enhanced by the recent institution of outturn returns required by the Secretary of State, and their results will gradually supplant the figures of the formulæ for all purposes. They have been criticised for the first time by Mr. Mollison, whose professional scrutiny affords an additional guarantee of value.

I have the honour to be,

Sir,

Your most obedient Servant,

E. L. CAPPEL,

Director, Land Records and Agriculture.

ANALYSIS OF CROP EXPERIMENTS.

NORTHERN DIVISION.

Ahmadabad.

Mr. H. O. Quin, Assistant Collector,

Sends two crop tests on irrigated rice which I have some hesitation in recording. His tabulated figures are in some instances incorrect and there are omissions. In one experiment 34 lbs. per acre is said to have been sown, in the other 18, and it is explained that it is difficult to ascertain the quantity of seed from which a rice crop has been produced.

The value of the straw is omitted. The yields of grain, respectively 1,564and 773 lbs. per acre, are estimated locally at 14 and 13 annas, while the yields according to corresponding formulæ would be 1,840 and 1,700 lbs. per acre. As a 12-anna crop in Dholka was (1884-85) 1,386 lbs. paddy and a 10-anna one in Sánand (1885-86) 1,670 lbs., it appears that the anna estimate of the crops under test is too high, especially in Experiment No. 2. Compared with Experiment No. 1 it is not more than 6 or 7 annas. The average of rice for Daskroi was 12 annas. It is to Mr. Quin's credit that he conducted these tests notwithstanding that he held double charges for some time and was also under pressure of Census work, but the crop in Experiment No. 2 was badly selected, being far inferior to the average for the táluka.

Mr. J. K. N. Kábráji, Assistant Collector.

The outturn in this officer's cotton test is open to question on the score that the crop was only picked twice, the first time in January and again a month later. The crop appears to have been over-ripe in January. I judge of this by the weight of raw cotton then gathered, 246 lbs. per acre. This is an extraordinarily large amount for one picking. The second picking in February was not made under the supervision of the experimenter, and it is not stated whether there were any immature bolls at this time which would have ripened later on. The seed rate, 18 lbs. per acre, is double that of the formulæ.

The land was manured before sowing with five cart-loads per acre, cattle manure and refuse. The gross outturn is valued at Rs. 18-14-3, and incidence of assessment works out 9·6 per cent. Season and cultivation were good. The crop was locally estimated at 14 annas, while the general average for the táluka was 12 annas only. Cotton in this district is sold in the shell husk. The experimenter writes: "Merchants give out the pods to be opened and the work is done to a great extent by the women of every household, the remuneration being ordinarily 1¾ annas for a maund of pods." About 3 per cent. of these pods are *gogdas* or unburst bolls. These are either fed to the cattle or are beaten and an inferior quality of cotton taken out. Below I note the proportion of useful products and valueless by-products from the area experimented upon :—

Pods.		Shells.		Gogdas or unburst bolls.		Raw cotton, kapas.	
Lbs.	tolas.	Lbs.	tolas.	Lbs.	tolas.	Lbs.	tolas.
185	30	47	7	6	6	132	17

The raw cotton ginned gave 32·5 per cent. clean cotton and 67·5 per cent. seed.

Mr. G. S. Curtis, Assistant Collector.

This officer submits an experiment on red wheat, which is omitted. He says the crop was not an average one, and that the field tested was not selected until

the greater part of the wheat in the district had been harvested. It is evident that the crop had been sown late ; moreover, it was injuriously affected by cold and blight, and the returns are so much under average as to be merely misleading.

Mr. E. Maconochie, Assistant Collector.

Rice, irrigated from a tank and grown on mixed black soil, is the subject of this officer's test. The assessment (water-rate included) comes to Rs. 6-4-0 per acre.

The season was favourable and the cultivation good, but the yield (987 lbs. of unhusked grain per acre) is rather disappointing. The incidence of assessment (14·02 per cent.) might be lowered by growing a second crop. The crop is much over-estimated at 16 annas if the corresponding formulæ are any guide. According to the Collector, an average rice crop in Sánand for the year is estimated at 8 annas = 975 lbs. per acre.

Kaira.

Mr. J. W. A. Weir, Assistant Collector.

Mr. Weir sends three ordinary experiments, all carefully made. Rági yielded well on land assessed at about Rs. 5 per acre, which for the last three years has been continuously cropped with mixed bájri and kodra. This season the land was manured with 10 cart-loads per acre of cowdung, ashes and sweepings, and although this is by no means a liberal dressing, it is the quantity usually applied every third year. The crop was grown from transplanted seedlings, but it is not quite clear how much the seed rate really was—presumably about 8 lbs. per acre, which is higher than usual. A $\frac{3}{4}$th guntha seed-bed was found large enough to furnish plants for one acre. 1,230 lbs. grain per acre is held to represent an average crop. The value of the gross outturn comes to Rs. 34-2-3 per acre. The weight of by-product must have been under-estimated.

Similar soil in the same village, assessed rather higher, growing kodra this season, formed the subject of Mr. Weir's second experiment (No. 6). The cropping of the three preceding years is recorded thus :—

1 Jowár ; 2 Kodra, Tur ; 3 Jowár, Math.

The seed (about 15 lbs. per acre) was drilled with a three-coulter drill in June, the land having previously been manured with 10 loads per acre ordinary manure. Considering that the season was favourable and the cultivation good, the incidence in column 11 (17·18 per cent.) appears rather high, especially as the yield reaches the bumper standard according to the formulæ.

The results obtained in the third experiment (No. 7) are more satisfactory. The tested area is rice land, assessed at a high rate, growing rice every year and irrigated from a private well. This year the cultivator tried a change of seed, viz., *jirásál* rice grown at Daskroi. This may or may not have influenced the outturn. In any case it was abundant. The incidence of assessment works out 6·44 per cent., apparently a happy result in the case of land assessed at Rs. 7-1-3 per acre, but, in the words of the experimenter, "it would be fairer to offer an opinion on this point after counting the cost of irrigation and cultivation."

The area of seed-bed per acre transplanted (2 gunthas) is probably an under-estimate.

Mr. Motilál Chunilál, District Deputy Collector.

The test area of Mr. Motilál's rági experiment is unnecessarily large. It extends to 34 gunthas and covers the whole of a survey number. The risk of inaccuracy is thus enhanced, and several errors of calculation have been corrected in this office.

A small sprinkling of kidney-bean covering $\frac{1}{17}$ of the whole area yielded badly. It was probably suppressed by the vigorous rági grown from seedlings

and planted in August. Seed at the rate of 8 lbs. per acre (an unusually high rate) was sown in a seed-bed nearly a guntha in extent. The land was manured in June by folding goats, the shepherd receiving 2 maunds of bájri and 2 maunds bávto. This means an outlay for manure of Rs. 4-11-3 per acre.

This land usually grows coarse millets, with subordinate pulse mixtures, and this season with good cultivation and sufficient rain shows a yield giving an assessment incidence of 15 per cent. The experiment is not sufficiently careful to be quite satisfactory.

Mr. Motilál furnishes a second ordinary test (No. 9) in which sesame and tur are subordinate to the principal crop, kodra. The soil (*gorádu*) is fertile and has carried during the previous three years successive crops of bájri with pulse mixture. The land was manured with nine loads per acre farmyard manure applied in June. Seed was subsequently sown in the following proportions :—

	Lbs.	tolas.	
Kodra	12	12	per acre.
Tur	4	4	do.
Sesame	0	26	do.

The resulting crop covered the ground in the following ratio :—

Kodra 5, tur 3, and sesame 2 gunthas.

It is not understood how the seed could have been drilled to produce this result. The experimenter remarks upon the careful manner in which tillage operations were conducted. The outturn is satisfactory and such as a careful cultivator might reasonably expect in a year when the rainfall was sufficient and well distributed for the crops under experiment.

Panch Mahá'ls.

Messrs. A. F. Maconochie and A. F. Woodburn, Assistant Collectors.

Two ordinary experiments on consecutive crops, following each other on the same land in one year. The first experiment was made by Mr. Maconochie on the principal crop, maize; the second by Mr. Woodburn on the secondary crop, gram. The maize was manured with 11 cart-loads per acre of farmyard manure applied in May. The seed was sown in June and the crop harvested in September. Gram, as usual, unmanured, was sown in November and reaped in February.

These experiments would have been of more value, if the conditions of cultivation were ordinary. The land was, however, foul with *chida* grass, which would seriously affect the principal crop, maize, but would not be equally injurious to gram. Gram is often grown as a catch crop with the object of suppressing weeds. No safe or reliable deductions can be drawn from any experiment conducted on land stocked with weeds. At the same time we have, in the experiments commented upon, an instance of land that is assessed at a rate so low that, with indifferent cultivation, the incidence is 1·6 per cent. I attach little value to these two experiments, because the conditions were not average and because the anna estimate is also almost certainly wide of the mark. The year's rainfall was favourable to maize, the general average of which for Godhra was 14 annas, whereas the local estimate is given at 8 annas. The rainfall was less propitious for gram and the Godhra average was 4 annas; yet an estimate of 20 annas is given in the present case. However, the experiment goes to show how successfully gram can combat weeds which seriously damage other crops.

Mr. Pránlál Harkisandás, District Deputy Collector,

Submits four ordinary crop tests, affording a comparison of the returns from two fields of like character which usually each year carry a principal and an auxiliary crop. It is curious that the higher assessed land appears to be least valuable in a year of less than average rainfall.

Mr. Pránlál's first experiment (No. 12) was on a middling crop of rice, broad-casted but not transplanted. The land was fairly manured with cowdung before sowing. Mixed wheat and gram taken as a second crop was practically a

failure, because September rains were scant and the moisture left in the soil after the rice was reaped was insufficient. Moreover, slight damage was done by frost. On the gross value of produce for the year the cultivator got a return of Rs. 28-13-2 per acre, the percentage incidence of assessment being 11·04.

In the second field rice again was the principal crop and formed the subject of the 1st test (No. 14). The crop was less liberally manured than in the other field, only 3 cart-loads of cowdung per acre having been applied, and seed at a slightly higher rate was sown a fortnight earlier, 87 lbs. per acre having been broad-casted on the 3rd of July. The resulting yield is valued at Rs. 8 per acre more than in the former experiment. Both rice crops ripened at about the same time, 20th October. The difference in the returns from the two fields would be inexplicable, but for the explanation that the second field lies lower than the surrounding land. Thus the natural drainage was sufficient to maintain the rice crop in fair thriving condition until harvest. The fair yield of wheat taken as a second crop is accounted for in the same way. The gross returns for the year came to Rs. 57-10-0 and the percentage incidence of assessment works out 3·87, a very favourable result in a year of scant rainfall.

Broach.

Two ordinary tests in cotton were received from this district. Under standing orders two more ordinary tests should have been made, but the Collector explains the deficiency as due to the transfers of the officers concerned.

Mr. S. L. Batchelor, Assistant Collector.

This is an instructive experiment on cotton, intelligently worked out. The dates of picking and weights of cotton gathered at each picking are marginally noted. They contradict a common but erroneous belief that the first picking is the most important in all cases. Mr. Batchelor's explanatory notes show that the cotton might have matured over a more extended period, but early in February there were four or five nights frost which proved destructive to unripe bolls. The land was twice ploughed and manured with 12 cart-loads of cattle and goat droppings. Unless the land was foul, this is a more than ordinarily good preparation for cotton. The season was fair. 590 lbs. of crude fibre obtained per acre is a full average yield. The prices obtainable at date of experiment were low owing to a depressed state of the market, and the percentage incidence of assessment was therefore raised to 13·29. Broach is generally regarded as a highly assessed district, and this experiment supports the belief. Cotton as the staple crop, when cultivated under average conditions, ought to show a smaller percentage incidence of assessment on yield, because other crops grown in rotation with it are only indirectly profitable, taking the place of a bare fallow. The experiment is a satisfactory one, and, no doubt, entailed a considerable amount of painstaking labour.

Date.	Yield of 8 gunthas.	
	Sers.	Lbs.
		Lbs. tolas.
3rd January ...	13⅓	13 26⅔
8th ,, ...	7½	7 27
16th ,, ...	18	18 18
25th ,, ...	26	26 26
30th ,, ...	21	21 21
13th February ...	24⅓	24 37⅓
28th ,, ...	5	5 5
Total ...	115⅙	118 4⅔

Messrs. Sorábsha Hormasji and Chunilál Venilál, District Deputy Collectors.

Mr. Chunilál submits one ordinary experiment on cotton, which is not altogether satisfactory. It was begun by one officer (Mr. Sorábsha) and finished by another (Mr. Chunilál), and the information conveyed must be accepted with some degree of caution. The explanatory notes are meagre. This much can be gathered that the crop on this particular area was 50 per cent. better than on the rest of the field; and, unless the experimenter wished to prove some special point, this is against standing orders. The main portion of the field appears to have been continuously cropped for years with cotton in rotation with jowár, while this particular part of it had only recently been brought under the plough.

The first picking on the 20th of January was, in point of value, the most important. It is not usual, however, to gather 57 per cent. of the whole yield at one time, which was done in this instance. Under the circumstances I must suppose that many of the bolls were over-ripe and had fallen to the ground and were lost. The experimenter says the crop was affected by cold. It would be interesting to know when the cold or frost occurred and how much the subsequent pickings were affected by it.

One item of information is valuable, viz., the percentage of clean cotton, seed and waste resulting from ginning with a hand machine.

Approximately the results were as under:—

Cottonseed	... 59 per cent.
Clean fibre	... 39 ,,
Waste	... 2 ,,
	100

Ordinarily the proportion of clean cotton to cottonseed is 1 : 2.

The cotton under experiment appears to have been of superior quality.

Surat.

Notwithstanding the heavy Census work and transfers of district officers, the Collector was able to forward 10 ordinary experiments from this district, most of which are valuable. According to the programme, experiments were to be made this year (1) in lands growing sugarcane once in three or four years, (2) in lands entered in the village papers as tank numbers, (3) in lands growing double crops, viz., rice followed by vál, &c., in the same year, and (4) on castor. The experiments conducted are:—

Mr. Syad Nuruddin Khán ...	... 6 Ordinary.
„ E. Maconochie	... 1 sugarcane.
„ Umedrám Ranchordás ...	... 2 wheat.
„ D. N. Nánávati	... 1 vál.
	10

Of the 6 experiments received from Mr. Syad Nurud Din Khán, 2 were in sugarcane, 3 on second crops, peas, vál and gram, and the last on castor. The experiments on peas and vál were specially made on tank numbers (*vide* remarks in Crop Experiment Report, 1889-90, p. 6). All these experiments, being properly conducted and exhaustively reported of, are most useful and reflect credit on the experimenter.

Mr. Syad Nur-ud-Din Khán, Assistant Collector.

It is most creditable to this officer that, in a Census year, he was able to submit a series of 6 good experiments.

This officer's sugarcane tests are most commendable. His explanatory notes are elaborate, the minutest detail of cultivation being fully and faithfully recorded. He also gives an exact account of the harvesting, cane-pressing, and gul-making processes, and adequately fulfils the main object of his experiments, which was to estimate the comparative values of two known varieties of cane. It is difficult to condense the report without omitting points of practical importance. I will, however, endeavour to explain the test in a concise form.

The two varieties tested were Khajurdi and Malbári. The first-named is a small indigenous sort. The latter is a large succulent cane of the white Mauritius kind, which flowered, a sign of robust constitution and not of maturity, to which the experimenter attributes this rather unusual occurrence. The profits per acre from the two crops may with advantage be compared, but not the weights of produce, because the one field was manured and otherwise treated differently from the other. The following statement of results will, however, be useful for record:—

Yield from five Gunthas tested.

	Khajurdi.		Malbári.	
	Lbs.	tolas.	Lbs.	tolas.
Number of canes cut	4,070	0	2,030	0
Weight of canes stripped and topped	9,957	29	8,089	28
Weight of tops	1,006	23	1,022	28
Weight of juice	6,855	26	5,648	17
Weight of gul	1,073	0	1,089	35
Percentage juice to cane	68·8		69·8	
Percentage gul to juice	15·6		19·2	
Percentage gul to cane	10·7		13·4	
	Ft.	in.	Ft.	in.
Average length of canes	6	11	8	9
Average circumference of canes	0	$3\frac{2}{5}$	0	$3\frac{5}{8}$
	Rs. a. p.		Rs. a. p.	
Value of canes required to replant an acre, 1,800 whole canes being used in each case	27 14 10		65 8 11	

The khajurdi test was conducted on gorádu land, assessed at Rs. 12-1-11 per acre, and commanded by a well which existed before the original survey. The cropping during the previous three years is detailed thus:—

1886 sugarcane; 1887 rice and tur; 1888 rice, plantain and ginger.

The crops grown in the last-named year were rather liberally manured. During the months of April, May and June 1889, 200 cart-loads of earth from the adjoining rice land was carted to this field and carefully spread. A further pressing of ordinary manure to the extent of 30 loads per acre was applied before the monsoon. As soon as the soil was thoroughly soaked, *san* was broad-casted and allowed to grow till September, when it was ploughed in as a green manure, having meantime attained the height of 3 feet. Subsequently, the land was ploughed sixteen times and levelled with a log harrow (chowpan) eight times. The land must have been foul, to necessitate such an amount of tillage. The planting was done in November, and in the following manner according to the experimenter's description. It is accomplished "by means of the nángar. This is an appliance somewhat resembling the ordinary plough but heavier. It has, however, a tube or nozzle attachment, so arranged that the canes passed into it, while the nángar is being worked, are left imbedded in the soil at a depth of four inches or so in straight furrows made by the nángar." The field was afterwards subjected to 13 copious waterings between February and October. During the intervals between the first 8 waterings, the land was seven times thoroughly weeded, and the surface soil, when it caked hard in the sun, was loosened by means of the kudál. The canes were more or less damaged by jackals, pigs, and rats. The experimenter attempts to estimate the cost of cultivation as well as cost of harvesting and manufacturing the crop. The cultivation charges are approximate, but so much borrowed labour was used for harvesting and gul-making, that the cost could only be guessed at and therefore need not be recorded.

The experimenter does not mention the type or size of the cane-mill in use, but gives exactly the time required to express the juice from a given quantity of cane, 401 lbs. of cane, from which 68·8 per cent. juice was extracted, being passed through the mill each hour. The weight of juice required to "charge" the evaporating pan was 527 lbs. This quantity was boiled down in two hours and four minutes.

The second experiment with Malbári cane was conducted on darker soil, assessed about the same rate, and also irrigable from a well. The cane plot

extended to 1 acre and 19 gunthás. The cropping during the previous three years is stated thus:—

1886 sugarcane; 1887 rice; 1888 rice and vál.

No manure was applied directly to the sugarcane plot; but the previous rice crop sown in June 1889 was manured with ordinary farm yard manure to the extent of 66 cart-loads per acre, of which a considerable unexhausted value must have remained. The preparatory tillage consisted of six ploughings and one levelling with log harrow, all this being accomplished during the months of October and November. The cane was watered six times between February and June. Each flooding occupied ten days. In the intervals between waterings, the land, as it dried and caked, was dug and loosened with a kudál, but it was only once weeded in June, when the canes had attained the height of about 5 feet. The field was carefully watched and fenced, and the result was that the canes were not damaged to the same extent as in the first experiment. In this test 313 lbs. cane, yielding 69·8 per cent. juice, was passed through the mill in one hour. 513 lbs. juice was sufficient to charge the evaporating pan, and this quantity was boiled in two hours and thirty-nine minutes.

The comparative results financially stand thus:—

	Malbári.			Khajurdi.		
	Rs.	a.	p.	Rs.	a.	p.
Value yield per acre	591	6	0	550	4	8
Cost per acre	335	1	4	409	7	1
Net profit per acre	256	4	8	140	13	7

The Malbári crop was estimated locally at 13 annas, the khajurdi at 14 annas; and the experimenter adds the remark that sometimes worse crops are grown often better and that this season the cultivators were satisfied with the outturn. The incidence of assessment is low in both tests.

Last year a crop test submitted by this officer drew attention to a method of cultivation peculiar to the Bulsár, Chikhli and Párdi tálukas of this Collectorate, viz., the system of growing rabi crops on tank areas, which early in the season held water sufficient to irrigate the adjoining rice fields. Such land is assessed at a comparatively low rate. The information gleaned from last year's experiment was not satisfactory. Further information was deemed desirable and the present tests were undertaken to furnish it.

The tank area in the first experiment (No. 20) extends to 4 acres and 19 gunthas, the assessment being Rs. 13 per annum. The crops usually grown are peas, gram and kodra. This year the high-lying portions of the land, owing to want of moisture, were left fallow. A part was allotted to kodra, while the remainder (2 acres and 32 gunthas) was occupied by peas. The water subsided in October and the seed was then drilled, the seed rate being 40 lbs. per acre. No explicit information is offered in regard to preparatory tillage. It is not stated whether the land was ploughed or not. The resulting crop was classed locally as 12 annas, the yield, 588 lbs. per acre, being higher than in the formulæ. The Collector thinks the experimenter has estimated the value of by-products too high in this as well as the next experiment, but it must be borne in mind that both pea and vál produce excellent fodders, and command a good price at this particular season of the year when cattle food is usually scarce.

The crop was ripe at the end of January. The gross returns per acre were worth Rs. 17-9-3, the incidence of assessment, 16·5 per cent, being rather high.

For the sake of comparison another tank number was tested (Experiment No. 21). In this instance the percentage incidence of assessment is also high, but it may be noted that in both areas the cultivation was indifferent. The area of this tank is 2 acres and 8 gunthas. This year vál was the crop grown. There is nothing in the experimenter's narrative to show that the cultivation varied from that in the other test. The assessment is practically the same. The outturn was poor, only 370 lbs. per acre, which according to the formulæ represents less than half a crop.

The next test (Experiment No. 22) shows the effect of fallowing exhausted land. A poor crop of castor two years since determined the cultivator to allow the land to lie idle for a year. The crop now grown was gram. This was a wise choice, and proves that the cultivator knows that leguminous plants exercise a recuperative influence on exhausted land.

The outturn (408 lbs. per acre pulse) is estimated as a 12-anna yield. The seed, 71 lbs. per acre, was borrowed on the "dohodi" system. In preparing the field for sowing it was embanked for the retention of moisture.

I quote the following from the experimenter's notes :—

"The lands in the Párdi Táluka being mostly held by the *káli paraj* the assessment was some twenty years ago fixed at a low figure owing to the proverbial poverty of the class. They are, however, hardworking cultivators and know how to make the land most productive".

Castor grown on low-lying land, assessed at Re. 0-11-6 per acre, forms the subject of the next test (No. 23). The seed rate is much higher than common, and probably not correctly estimated. This experiment is mainly of interest, because the experimenter took the trouble to determine the percentage of oil to "khol" in expressing castor-seed. His results he details in the following tabulated form :—

Yield of 8 gunthas experimented on.						Average value per acre.	Assessment per acre.	Percentage incidence.
Weight of seed.	Weight of oil.	Weight of khol.	Value of oil.	Value of khol.	Total value.			
Lbs. t.	Lbs. t.	Lbs. t.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
91 3	35 22	49 13	4 11 0	0 5 0	5 0 0	25 0 0	0 11 6	2·87

It will be seen that there is a considerable percentage of loss in the process.

Castor cake is largely used as a manure, and for this purpose is exported from Gujarát in considerable quantities. The Poona District gets its quota principally for cane-culture. At Poona the price of "khol" is much higher than that quoted in the above table, which works out 158 lbs. per rupee, whereas at Poona 80 lbs. has the same value. The cost of transport accounts to some extent for the difference.

Mr. E. Maconochie, Assistant Collector.

Mr. Maconochie's crop experiment on sugarcane has been worked out with care, but his figures are not altogether accurate. The variety of cane was *Vánsi*, a small thin inferior sort; yet an average crop, irrigated in an intermittent manner and by no means liberally manured, gave a cash return of Rs. 311-10-6 per acre. Mr. Maconochie estimates the number of canes required to furnish sets sufficient to plant an acre at 1,777, while he gives the actual number of canes found growing on a four-guntha patch as 5,100, or 51,000 per acre. The number of canes required to furnish sets must have been under-estimated. Ordinarily an acre of average cane will replant 8 acres. Mr. Maconochie's figures show that an acre would replant 28 acres.

The percentage of juice to cane is unusually low; 70 per cent. would be nearer the mark than 49 per cent., to which the figures given work out. It may be that the crop was over-ripe. Sugarcane is usually a twelve-month crop, but fourteen months had elapsed since the one experimented with was planted. The percentage of gul to cane is only slightly under average.

It is not usual for sets to be trodden in with the foot to a depth of nine or ten inches. The following is the more common practice. Each bed, before it is planted, is flooded. The sets are laid lengthwise in the furrows and pressed down with the foot of the planter into the soft mud, but when the water subsides only a thin layer of soil, certainly not more than 2 inches in thickness, covers each set.

This experiment shows that suitable land is capable of producing a remunerative crop of sugarcane, if aided by only a moderate dressing of manure applied during the rains. The crop was planted in December.

The manure was not applied until the following August. But the previous history of the field shows that the soil might, and no doubt did, contain an unexhausted residue of manure which had been applied, annually in moderate quantity, to the three previous crops. The sugarcane, therefore, found in the soil sufficient plant-food to carry it on in a healthy condition until manure was applied eight months later.

Mr. D. N. Nánávati, District Deputy Collector.

Mr. Nánávati furnishes an experiment on vál (No. 25). It has been worked out with care, and the calculations may be accepted without hesitation. It is a common practice to grow a second crop on all rice land, but especially on such as is heavily assessed, usually vál mixed with oil-seeds in this district. In the experiment reported, vál was grown alone. The value per acre of the principal product of this crop seems to show that the cultivator gets his main profit from the auxiliary and not from the rice crop. Moreover, the cost of preparatory cultivation for the second crop is light.

Immediately after the rice is harvested one ploughing is necessary, and as the drilling of seed and the ploughing proceed simultaneously (the *orni* or seed drill being attached to the plough), only one or two subsequent turns of the harrow are required to produce a sufficiently good tilth.

All manure is applied to the land before the monsoon rains set in, and before the rice is planted. Doubtless the second crop derives some benefit, particularly if the application was a liberal one. In this test 40 cart-loads of cowdung per acre were applied. The experiment shows that 76 lbs. seed per acre, drilled in November, on land in good heart, will produce by the following March a crop of vál yielding 26½ bushels of pulse per acre, weighing 65 lbs. per bushel, valued with the useful by-products at Rs. 50-13-9 per acre.

Mr. Umedrám Ranchordás, District Deputy Collector,

Submits two wheat tests taken in two fields in different villages in the same táluka. The land of each field is of like character and similarly assessed. The conditions of season and tillage on each are alike favourable. The dates of sowing and seed rate are practically identical. The returns from the one are, however, much better than those from the other. This may fairly be attributed to the difference in the manurial condition of the land. The field that yielded best had lain waste, as grazing ground, for forty years, and has only been regularly tilled within the last five. This accounts for the productive power of the soil. Moreover it was slightly manured this season by folding sheep in June, whereas the other was unmanured.

Tha'na.

Three officers conducted experiments during the year under report in this district, viz :—

(1) Mr. R. M. Kennedy: 2 ordinary experiments in rice in Sálsette and Bassein.

(2) Mr. J. M. Cursetji: 1 ordinary experiment in nágli in Bhiwndi.

(3) Mr. J. P. Orr: 1 ordinary experiment in sweet vál in Karjat.

According to the standing orders, two more experiments, one from Mr. Orr and one from Mr. J. M. Cursetji, should have been received; but the Collector says :—

"It has to be remembered that all officers, and particularly the First Assistant Collector, have worked under very heavy pressure this year."

Mr. R. M. Kennedy, Assistant Collector,

Made two ordinary experiments on early rice, his object being to show the value or effect of different manures. This is a question that cannot be determined by one test, nor can reliable information be gained unless the areas selected have been previously equalised. This fact, I have no doubt, was present in th

experimenter's mind when he selected the areas tested. He probably considered both soils of like character and quality; but there is nothing to show that the *condition* of the field was at all similar. The one might have been much in need of manure, the other in fairly good heart. Be this as it may, if the experiments are not valuable in the respect intended, they are otherwise of interest. With the aid of a very judicious admixture of manures, capital crops were grown in each case. The value as manure of crushed sugarcane, which is commonly burnt as fuel in the "boiling process," is well brought out.

In the first experiment (No. 28) four cart-loads of cowdung were applied in May and four maunds of fish manure in June. The season was specially good. The area selected consists of good black soil, growing rice every year. The cultivation is described as good. The crop was grown from seedlings transplanted in the end of June and raised on a rabed seed-bed, the area of which is not shown. The crop, a bumper, was harvested in October, and yielded 3,282 lbs. grain per acre, which with the by-products gave a gross value of Rs. 91-12-0 per acre. The land is assessed at Rs. 6-1-6 per acre.

In the second experiment (No. 29) the land is assessed at Rs. 4-3-4; the total value of yield per acre is Rs. 76-11-6, the weight of the principal product being 2,591 lbs. per acre. The character of season, cultivation and rotation are identical with those of the previous experiment. The manure applied differs. Two cart-loads cowdung, 1½ carts of crushed sugarcane and one cart-load of wood-ashes were applied per acre in May; 5 maunds of oil-cake were applied in July. In this case also the crop is estimated at 20 annas.

Mr. J. M. Cursetji, District Deputy Collector.

Mr. Cursetji's rági test, though accurately and carefully reported, is not a useful one and might be misleading. The crop was grown on a plot of land rented at two rupees per acre for use as a rabed seed-bed for rice. This plot forms part of a large survey number of warkas land assessed at four annas per acre. The cultivation of rági is subsidiary to that of rice seedlings, a small corner being reserved as a rági seed-bed. When the rice seedlings are removed, the rági seedlings are planted out over the whole area. The experimenter shows that a two-guntha seed-bed, rabed with 8 cart-loads of cowdung and sown with 1⅓ lbs. seed-will furnish rági seedlings sufficient for an acre. The yield (810 lbs. grain per acre) is valued at Rs. 33-4-0 per acre.

It may be noted that this land requires occasional fallowing for its special purpose. Going back five years, we find it has been used as a rice seed-bed for three, and grew in those years the following sequence of *after*-crops; 1st rági, 2nd sesame, 3rd udid; it was then allowed to lie fallow two years. I am compelled to exclude this experiment, because it is vitiated by the special character of the land. The incidence of assessment (0·75) is calculated on the average assessment of the whole number; and the inference is of course a false one.

Mr. J. P. Orr, Assistant Collector.

Great care is displayed in Mr. Orr's test on sweet vál, though he is a new experimenter. This pulse takes its usual after-crop place in a rice field. The experimenter notices that the stalks are more valuable for ráb purposes than for fodder; but the leaves and chaff are a valuable cattle-food. The yield of a secondary crop after rice is much influenced by the amount of moisture left in the soil after the principal crop has been reaped, as well as by the character of the season subsequently. These conditions seem to have been propitious in this instance, and a bumper crop was the result. 62 lbs. seed per acre (the bushel weight of the produce was 66½ lbs.), broad-casted in the middle of December, produced towards the end of the following April 1,195 lbs. pulse per acre, which with the by-products was valued at Rs. 33-5-0. This must be considered a handsome return.

CENTRAL DIVISION.

Kha'ndesh.

Only five ordinary crop experiments are received from the district conducted by—

Mr. K. R. Bomanji	...	...	... 2 ordinary.
„ W. H. Lucas	...	...	... 1 do.
„ K. Kamruddin	...	...	... 2 do.

The District Deputy Collector, Mr. Shrinivás Báláji, was able to conduct no experiment during the year under report, stating that he was prevented by the exigencies of Census work.

Mr. K. R. Bomanji, Assistant Collector,

Sends two linseed tests conducted in the Shirpur táluka. Owing to want of late rain and unseasonable sowing, the crops experimented upon were practically a failure. The experimenter forwards one sample ser to represent both his tests, believing, I suppose, that a sample ser of one linseed crop must be of equivalent weight to a sample ser of another. The weight of the sample ser recorded is not correct. The area of test in both experiments was very large, and, from his remarks, appears not to have been actually measured. The experimenter has not adhered to standing orders and his report is carelessly worked out. Both these experiments are, therefore, omitted. No useful deductions could be got from them.

Mr. W. H. Lucas, Assistant Collector.

Some interest attaches to Mr. Lucas's wheat experiment beyond that of an ordinary test. The crop was neither wholly dry nor wholly irrigated, a condition of cultivation not unusual in Khándesh when well water is available and late rains scant. The crop was flooded three times, the effect being that it matured less quickly than dry-crop wheat sown at the same time.

The yield, 890 lbs. grain per acre, classes this crop as a 13 anna one. The weight of straw only exceeded the weight of grain by 290 lbs. per acre, which proves that the crop required more moisture at some stage of its growth or that the soil lacked manure. A crop of jowári followed by a crop of cotton had been taken since the land was manured with five cart-loads per acre of cow dung in 1888.

The field is black soil, indifferently cultivated and assessed at practically Rs. 2 per acre. The incidence of assessment is comparatively low, but the extra expenses incurred in irrigation must be considered, Rs. 25, or Rs. 6¼ per acre, having been paid to a neighbour for the use of his well.

The experimenter attempts to make his test a special one by detailing the cost of cultivation per acre; but the figures can only be approximately correct. The crop is debited with ⅓rd the value of manure applied three years since. I doubt if it benefits from the unexhausted value to that extent. The experimenter puts no value against manual labour furnished by the cultivator's household. The experiment is, however, a good and careful one.

Mr. Kázi Kamruddin, District Deputy Collector.

Notwithstanding stress of revenue and census work, this officer has been able to send two well-conducted experiments on crops in regard to which special information was desired.

Sesamum, the first crop tested (No. 32), was grown on baradi land, a medium quality of soil assessed at Re. 0-7-4 per acre. The land had been lying waste two years. The area selected for experiment (20 gunthas) is more than that allowed by standing orders, but when it is known that the average produce of an acre does not usually bulk much, no objection need be taken. 12 lbs. seed per acre (double the ordinary quantity) was drilled in June. The crop was ripe in October.

The gross value amounts to Rs. 12 per acre, and local estimate makes the yield a 12-anna one. Patches of *haridli* grass occurred through the field. No manure was applied. The cultivation was middling.

The experimenter details the various tillage operations and estimates the cost of production in this as well as in his other test. The figures are from hearsay only, and need not be recorded.

Mr. Kamruddin got in his second experiment (No. 33) a slightly better yield of linseed, grown on black soil assessed at Re. 1-0-4 per acre. The crop was estimated locally at 12 annas and had a gross value of Rs. 12-4-6 per acre. The two previous crops on this land were jowári after cotton. No mention is made of any manure having been applied within the last three years. 12 lbs. seed per acre drilled in October produced a crop which was ripe in February. Both season and cultivation were average.

Na'sik.

According to the programme, the crops selected for experiment in this district were niger-seed, sesame and linseed; and the experiments conducted were two in niger-seed by Mr. Deshmukh and two in linseed by Mr. Silcock. Mr. Thatte, District Deputy Collector, was relieved this year from the duty of experimenting.

Mr. H. F. Silcock, Assistant Collector,

Sends two tests on linseed. In each case the yield is disappointing. This is accounted for by the unfavourable character of the season. The experimenter attaches some interesting supplementary remarks to his tabulated figures. From these notes I extract the following:—Both crops grew on good black soil, free of weeds, and evidently well cultivated. The owners are well-to-do rayats. There was apparently very little difference as to yield in the appearance of the crops before harvest, but the best field yielded less than the poorer one. The difference is attributed to the fact that one field was sown at a more favourable time than the other. It is unusual to apply manure to these fields. If the early rain is favourable bájri is sown, otherwise jowári and linseed in rotation, and no fallows, but it depends upon the rainfall whether a kharif or rabi crop is taken. The land is ploughed three times, once deep in June and twice afterwards when some rain has fallen. It is then well harrowed and if there is not sufficient moisture for sowing, harrowing is continued apparently to allow the rain to sink well when it does come. Linseed is drilled with a three-coulter drill. The seed is harrowed in. Nothing more is done till the crop is ripe. The experimenter estimates the cost of cultivation at Rs. 5-14-8 per acre, which with three ploughings seems too low.

Mr. L. G. Deshmukh, Assistant Collector.

Two ordinary experiments on niger-seed. There is reason to suppose that the tested areas were not judiciously chosen, the experimenter himself remarking that the niger-seed harvest was nearly finished before the tests were conducted. The yields reported are suspiciously low, and, there being other elements of doubt, I am obliged to exclude these tests.

Ahmadnagar.

Mr. Sorábji Padamji, Assistant Collector,

Sends one ordinary experiment on wheat grown on dry-crop land as a second crop after bájri, but irrigated from a private well, because of scant rainfall. The crop was flooded every fifteen days.

A difference of 10 tolas in the ser of grain was found in this office as compared with the weight recorded by the experimenter. This throws some doubt upon the accuracy of the figures. Strict attention to standing orders would prevent the possibility of such discrepancies, and would have made this experiment much more trustworthy.

The explanatory notes are meagre. It is noted that westerly winds early in February occasioned "slight disease" in the crop. The nature of the disease or blight is left to conjecture. It was probably rust. Bakshi wheat grown on a red sandy loam, which was not manured and was rather foul, gave a fair yield (675 lbs. grain per acre). The fodder (straw and chaff) seems to have

been estimated rather than weighed. The figures given are evidently in round numbers. The sowing was done in November with a three-coultered drill, which was worked first lengthwise in the field and then across. This plan would ensure very equal distribution of seed. The gross returns per acre are valued at Rs. 25-7-6, which may or may not be a correct estimate. The crop was ripe on the 10th March and was weeded once—a month after sowing.

Mr. R. B. Stewart, Assistant Collector,

Sends two ordinary experiments. Jowári with safflower forms the subject of the first test. The subordinate crop practically failed for want of rain and for a similar reason the jowári yield was poor. The local estimate (14 annas) is absurd. I only include this experiment, because the crops of the district were generally below average.

Better results were got from gram (No. 38) grown as a second crop after bájri and irrigated from a well. This crop was grown on land which is assessed at Rs. 1-12-3 per acre. This includes a special water-rate. The experimenter fails to appraise the fodder value of the straw. In other respects the calculations are exact and careful.

The yield (482 lbs. pulse) makes the crop an average one. The seed, rated rather high at 76 lbs. per acre, was drilled in November. The land, heavily manured once every 3rd or 4th year, had grown the following crops during the last three years :—

1888 bájri and gram; 1889 jowári; and 1890 bájri and gram.

Mr. V. B. Vádekar, District Deputy Collector.

Mr. Vádekar's special test was conducted on a small holding of one field of 8 acres and 6 gunthas, assessed at Rs. 3. This is generally sufficient to maintain a hardworking family in comparative comfort. The results in the present instance bear out this belief. Looking at the previous cropping of this field, it seems that jowári with a subordinate crop mixture is grown annually. Jowári mixed with *kardai* was grown this year. The soil (*mál*) was fairly well cultivated. The land was ploughed this year, the ordinary practice being to plough once in three years. The cultivator has only one pair of work bullocks; he borrowed a team from a well-to-do relative. This was repaid during the year by an equivalent amount of bullock labour. The land was manured with 25 loads at a cost of Rs. 5. It is unnecessary to include this in the cost of production, because about three-fifth the amount of fodder grown is consumed on the holding during 7 months of the year by the two work cattle, and the droppings from these animals, the household waste, sweepings, ashes, &c., should make a compost heap of equal value. Five rupees worth of cake was used as auxiliary food for the bullocks during the time they were being worked. The land was ploughed in April. It took fifteen days with a four-bullock plough to cover 8 acres and 6 gunthas. Subsequently, the land was harrowed four times in May, June, July and August. Each harrowing took six days. The cultivator sowed the land in two days and was assisted by his wife, a hired labourer, and four hired bullocks. There was no further tillage. The cultivator watched the crop himself and, he and his wife together harvested it.

The seed was saved from the preceding year's crop. The usual dues to village servants were paid in kind. There were other outlays, which I will detail presently. The cultivator and his wife live entirely on the produce of the land.

The season was favourable and the crop was average according to the formulæ and according to local estimate. The soil of the field was not equal throughout. Due weight was given to this by taking test areas in different parts.

The proportion of outturn available for sale or home consumption is as under :—

		Lbs.
Gross yield from whole area: jowári grain...	...	5,417
Deduct—		
Quantity given as village dues	163 lbs.	
Seed for next crop ...	32 „	195
		5,222

			Lbs.
Gross yield of *kardia* from whole area ...	...	...	782
Deduct—seed for next crop ...	...	...	8
			774
Total weight of kadbi ...	...	...	16,952
Deduct—Fodder for two bullocks	...	10,080 lbs.	
Village dues ...	...	512 „	
			10,592
			6,360
Chaff : total yield	...	...	3,195
Deduct—village dues ...	...	...	69
			3,126

We have thus available for absolute disposal :—

	Rs.	a.	p.
5,222 lbs. of jowári grain, worth at 55⅓ lbs. per rupee	94	5	11
774 lbs. safflower-seed at 43 9/10 lbs.	17	10	1
6,360 lbs. kadbi at 320 lbs.	19	14	0
3,126 lbs. chaff	4	2	10
	136	0	10
Deduct—probable food for family during year, 1,080 lbs. jowári grain	19	8	4
	116	8	6

The expenses incurred during the year were :—

	Rs.	a.	p.
For clothing bought	12	14	0
For kámlis (three)	3	12	0
Oil-cake for bullocks	5	0	0
Hired labour	2	6	0
Local Fund cess	0	3	0
Government assessment	3	0	0
Condiments bought at the rate of 10 annas per month	7	8	0
Purchase of oil at 12 annas per month ...	9	0	0
Cost of a bullock to replace one lost by snake-bite, price Rs. 33 (one at this price will last, say, six years, so that the legitimate charge against this year would be Rs. 5-8-0)	33	0	0
	77	11	0

Thus after providing for the purchase of a new bullock, Government assessment and all other expenses of maintenance and cultivation, there is left a net gain of Rs. 38-13-6.

The cultivator was in debt to the extent of Rs. 150, and after paying an uxorious rate of interest, and meeting any miscellaneous expenses not calculated, he would probably just manage to avoid further indebtedness.

The experiment was well and carefully conducted by Mr. Vádekar, and is creditable to him.

Poona.

Mr. E. L. Cappel, Assistant Collector.

The crop experimented upon was potatoes, the most important garden-staple of the Khed táluka. During this season, and to a less extent during the past few years, this crop has been affected by a disease which I brought to notice during the season. This disease is forming the subject of separate enquiry, and it is only necessary to note here that it appears to be due to a new fungal pest. It is known as the *bángdi* disease, owing to the appearance of a dark ring in the tuber, on section, and the first apparent symptom is the sudden

wilting of the green top. Affected crops lose in size and weight, and in keeping qualities, many of the tubers also rotting in the ground. The disease is extending rapidly and threatens to destroy the potato crop of Poona and other districts in a few years.

The crop tested was not greatly affected by the disease. It appears that a good deep black soil, assessed at Rs. 5-4-2 per acre, growing bájri as an auxiliary crop to potatoes each year during the past four years, and watered from a private well which partially failed this year owing to deficient rainfall, is capable of growing under these unfavourable circumstances 10,940 lbs. potatoes per acre. This is locally estimated as an 8-anna yield, 16 annas being a " full average crop." A bumper crop would, therefore, yield 27,350 lbs. per acre, or above 12 tons, which in Europe would be an extraordinary outturn. The anna valuation is that of local cultivators, but is probably under-estimated. Again, it is hardly credible that 1,906 lbs. seed potatoes are required to plant an acre, particularly as each potato was divided into three or four sets, and it is likely that the information gathered is faulty on this point. If small potatoes or sets are used in planting, 900 or 1,000 lbs. per acre should be sufficient. About 22 cart-loads of cowdung and refuse were applied as manure per acre before seed time. The seed was planted in furrows in November. The crop was ripe early in March, and lifted by means of a plough. The haulms have no marketable value and are ploughed in as manure for the succeeding bájri crop. The gross money value of the crop was Rs. 118-8-8 per acre. The percentage incidence of assessment is 4·43. It must be noticed, however, that a crop of bájri had previously been grown on the same land, the value of which, if added, would reduce the rate of incidence.

Mr. S. R. Arthur, Assistant Collector.

The two crop tests submitted by this officer are most commendable. They show strict adherence to standing orders and deserve careful analysis. The selected field of jowári carried a crop which was considered an average one of the táluka. The yield of grain (482 lbs. per acre) is not large, and when the excellence of the season is considered the anna estimate is probably too high. Very little was expended in tillage, and nothing at all in manure, and a better yield could hardly have been expected. The soil, assessed at only 5 annas per acre, varies in character, the greater portion of the field being black. The present crop followed bájri mixed with *hulga* as a subordinate crop. The land was not ploughed since last year. 3¾ lbs. seed per acre, drilled in September, is a lower seed rate than usual, and Rs. 12-0-4 is a better gross return per acre than the cultivator had any right to expect. The crop was harvested on the 19th of January. The yields of grain and kadbi were respectively 482 and 1,824 lbs. per acre.

Mr. Arthur's second test (No. 42) on groundnut loses some of its interest, because his original programme was not adhered to. His first idea was to select a field near the Níra Canal, where the quantity of water used in irrigating the field could be gauged by metre. Arrangements were not completed in time, and this opportunity was lost. More advanced cultivation is apparent in this test than in the previous one. The returns per acre, Rs. 27-13-10, although fair, are not altogether satisfactory. The land is no doubt poor. Anyway it is only assessed at Re. 0-4-4 per acre, and the percentage incidence of assessment works out 0·97. The cost of cultivating a groundnut crop, however, is considerable. The land in the present instance was once ploughed, three times harrowed and manured with 25 cart-loads of ashes, &c., per acre. Add to this the cost of seed and sowing, 76 lbs. per acre having been drilled in June; add further the cost of manual labour engaged in irrigating, and, finally, the expenses incurred in harvesting the crop; and it will be obvious that returns will hardly cover expenses unless a good crop is produced. The cost of harvesting is considerable. The process, a laborious one, consists of hand digging, gathering by hand, and ploughing, to enable the cultivator to collect any remnant left in the soil. Groundnut, however, like all leguminous crops, is a good preparation for cereals, and cultivators appreciate this fully.

Mr. J. W. Mollison, Superintendent of Farms.

Mr. Mollison's sugarcane test has been most carefully worked out and is of much interest. His note on the cultivation is printed in full in the Appendix.

Shola'pur.

The crops indicated for experiment were groundnut, khapli wheat, and linseed. Only two officers conducted experiments on these: Mr. Doderet, one ordinary on groundnut, and Mr. Fry, one on groundnut and one on jod or khapli wheat. Mr. Doderet could undertake no second experiment, having charge of the Collector's office in addition to his own. Mr. Heblikar's one test was not on a selected crop, and his explanation is, in the opinion of the Collector, unsatisfactory.

Mr. W. Doderet, Assistant Collector.

The figures of Mr. Doderet's experiment are tabulated with care and are worthy of complete analysis.

We here (No. 44) find a field, the area of which extends to 24 acres, sublet to a cultivator for Rs. 175 the Government assessment being only Rs. 26. Thus the right of ownership is worth annually about Rs. 6 per acre. No cultivator could afford to pay this amount, unless he was prepared to farm well, and unless he could command irrigation facilities to ensure a crop in any season. About 13½ acres of the field are commanded by a well.

The experimenter does not say what the cropping of the whole field was in this or any previous year, but he details the rotation pursued during the last three years on the area, 4 acres 14 gunthas, selected for experiment and under groundnut this year. In 1888-89 it grew groundnut and chillies. In 1889-90 half was under sugarcane, the other half under jowári. The land was heavily manured, 27 cart-loads worth Rs. 9 being applied per acre. The manure was carted on to the land and distributed in heaps before the first monsoon showers, but not spread until the middle of June. The land, previously ploughed in April, seems to have been carefully levelled, and after the manure was spread considerable trouble was taken to incorporate it thoroughly with the soil. 125 lbs. seed (an unusually high rate) was drilled early in July, with a 3-coulter tiphan drill. The crop was subsequently thoroughly weeded, and the advantage of careful cultivation is evidenced by a very handsome yield per acre.

The outturn (3,450 lbs. per acre of unshelled nuts) is equivalent to 2,507 lbs. of clean kernels, and is worth Rs. 81-8-2; add the value of fodder estimated at Rs. 5-9-2, and we have a gross return per acre of Rs. 87-1-4. This represents according to the local estimate a 17 annas or slightly over average crop. The experimenter shows approximately the cost of cultivation, and probable profits. I cannot quite follow him in all his figures, but I extract the following, and give them for what they are worth, merely remarking that some of the labour was paid and some of it household labour. The women employed in digging and harvesting the crop were paid in kind, receiving one-fourth of what they gathered each day.

	Rs.	a.	p.
Cost of tillage, including irrigation, per acre ...	37	4	0
Cost of seed	4	0	0
Cost of manure	9	0	0
Rent, average for this part of field per acre ...	7	4	10
One-fourth gross value of nuts paid for harvesting .	20	6	0
Cost of production ...	77	14	10
Value of gross produce per acre	87	1	4
Cost of production	77	14	10
Net yield ...	9	2	6

The incidence of assessment is abnormally low, but the management of the cultivator regulates this to a very material extent.

Mr. T. D. Fry, Assistant Collector,

Sends two ordinary crop experiments. Although a new experimenter, his work shows care and thoroughness, and information of a useful character has been recorded.

The area of the first test (No. 45), of groundnuts, formed at one time the bed of a nála. The land may therefore be classed as alluvial and consists of a friable brown loam, overlying a sandy subsoil, the latter 18 inches below the surface. It appears never to have been manured, but of course profits by growth of leguminous crops in rotation. This land, assessed at Re. 0-13-3 per acre, has the advantage of being near a double *mot* well built before the original survey. The crop was watered every eight days and appears to have been benefited by the late rains in November. 96 lbs. seed (without shell) was drilled per acre 3 inches deep about the middle of June. Weeding was neglected.

The yield (2,540 lbs. per acre nuts in shell) according to local estimate represents an average crop, but the Collector thinks this estimate too high. The crop was ripe in February. The shell has no value except as manure.

In the second experiment (No. 46) irrigated spelt wheat was grown as a second crop after jowári. The crop was sown late, and this was probably the reason why it was affected by mildew. The yield (915 lbs. grain per acre) was by no means bad, considering the unfavourable circumstances; but being spelt wheat, the recorded yield does not represent the weight of *clean grain*, but of grain in husk. The experimenter by actual test found the proportion of the former to the latter to be as 3 to 4. The land was manured immediately before seed time with 10 cart-loads per acre of cowdung and ashes.

Mr. B. R. Heblikar, District Deputy Collector,

Sends an experiment on rabi jowári sown in September. This test I have some hesitation in reporting. The experimenter states in his explanatory notes that kharif crops were throughout his district generally a failure, whereas rabi crops, especially jowári, were good. In this test the yield of both grain and fodder was, however, unusually small; and although the crop is said to be locally estimated as an average one, I must class it much below that level.

Sa'ta'ra.

The First Assistant Collector, Mr. Snow, was debarred from conducting any experiment this year owing to Census work and Forest Settlement duties.

Mr. G. D. Pánse, Assistant Collector,

Submits a valuable sugarcane test, with details elaborately worked out. The results show a high outturn on good garden land assessed at Rs. 3-10-2 per acre. The cultivation of sugarcane appears to be specially advanced at Peth, where the experiment was taken. The experimenter remarks that the crop selected was neither inferior nor superior to those in other fields.

The results obtained are tabulated as follows :—

	Per acre.
Number of canes	37,326
Weight of canes (presumably with tops) ...	...lbs. 107,048
Weight of juice	... „ 58,613
Weight of gul	... „ 11,312
Value of gul	...Rs. 707-1-4
Estimated value as fodder of tops and residues as manure	„ 30-0-0
Estimated value of top ends of canes reserved for replanting	... „ 20-0-0

The last item is a low estimate; about half the canes cut furnished from the small end sets suitable for replanting. This practice is economical and is gaining favour elsewhere. The crop experimented upon would have yielded per acre 18,600 sets without materially lessening the outturn of gul. If whole canes were used their value would be about Rs. 50. The crop was irrigated from a katcha well, containing at the date of experiment (January) over 12 feet of water.

Chillies, groundnut and tobacco are taken in rotation with sugarcane. The land is evidently in good heart from previous manuring, otherwise 20 loads of ordinary bullock manure applied to 1 acre 16 gunthas could not have produced a crop so heavy as the results show. The Poona 3-roller mill is used, but the native wooden mill is also employed. Mr. Pánse proves the economy of iron mills and their use will doubtless extend. The price, Rs. 125 (with freight charges, Rs. 7-8-0, added), is not prohibitive.

Mr. Pánse gives in detail, with full explanatory notes, the cost of producing the crop tested. His calculations are based upon a labourer's wage at 2 annas 6 pies per day and a pair of bullocks costing 6 annas per day to hire, except where noted:—

	Rs.	a.	p.	Rs.	a.	p.
1. Ploughing, twice, (once crosswise)—						
Five pairs of bullocks and 4 men for two days each time and 12 annas extra for Dhuri bullocks				10	12	0
2. Manure—						
20 loads at Rs. 2 per load	40	0	0			
Cartage from Peth and spreading in field .	10	10	0			
				50	10	0
3. Levelling and preparing field for planting				2	10	0
4. Cost of 'sets' 16,000, bought at Rs. 2 per 1,000 ...				32	0	0
5. Planting—5 men employed 5 days				3	14	6
6. Repairing fence				1	0	0
7. Weeding—	Rs.	a.	p.			
Once bullock-hoed	2	1	0			
Three times hand-weeded	8	7	0			
Digging	0	10	0			
				11	2	0
8. Watering—	Rs.	a.	p.			
Done twice a week, 2 days each time. Four small bullocks and 2 men employed; *mot* self-discharging. One man in field; one man with bullocks: 2 men 209 days, at 2½ annas each per day	65	5	0			
Four bullocks 209 days, at 4 annas per pair per day	104	8	0			
Renewal of *mot*, ropes and contingencies ...	13	2	0			
				182	15	0
9. Harvesting and gul-making completed in 9 days—	Rs.	a.	p.			
7 men at 2½ annas each were employed cutting the standing canes, stripping them, carrying to Gurál, and preparing cane for mill	9	13	6			
2 men passing canes through mill, at 5 annas each, for 9 days	5	10	0			
2 bullock-drivers at 2½ annas each and 8 pairs of bullocks, 9 days, at 5 annas per pair ...	25	5	0			
3 firemen for 9 days at 2½ annas each ...	4	3	6			
Professional gul-maker and assistant ...	5	14	6			
2 men for 9 days at 2½ annas each, drying for fuel expressed cane	2	13	0			
Fuel bought (crushed cane not sufficient and too wet for fuel during the first two days).	20	0	0			
Hire of implements and utensils ...	13	8	0			
Oil for mill	0	8	0			
				87	11	6
10. Paid to Balutedárs				17	8	0
Cost of cultivation, &c., for 1 acre 16 gunthas				400	3	0
	Rs.	a.	p.			
Cost per acre	285	13	7			
Add—assessment	3	10	2			
Net cost ...	289	7	9			

The balance of income and expenditure stands thus :—

	Rs.	a.	p.
Value of gul per acre	707	1	4
Estimated value of by-product	50	0	0
Total ...	757	1	4
Cost of production per acre	289	7	9
Net profit per acre ...	467	9	7

The outturn equals that of a good crop on the deep soil near Poona, while the cost of production is much less.

Mr. Pánse tested groundnut (No. 49) in the same village. The crop was grown on first-class black soil assessed at Rs. 1-14-7 per acre and irrigated from a well. To 1¾ acres were applied 10 cart-loads of cattle manure after deep ploughing in April. 200 sheep were folded during five nights.

The season was favourable, cultivation good, and outturn satisfactory. The yield varied; one patch gave an outturn of 74 lbs. 9 tolas per guntha, another gave 88 lbs. 15 tolas per guntha, while a third gave 122 lbs. 21 tolas per gunthas

The average is 103 lbs. 4 tolas per guntha. This equals 4,124 lbs. 17⅓ tolar of nuts in shell per acre, having a money value of Rs. 103-1-9. The experimentes estimates the crop at 17 annas. Bhuimug is usually sold in the shell. The proportion of nuts in shell (shengas) to clean kernels is as 4 : 3. The seed was sown about the 7th June by two men following a two-bullock plough and dropping the seed in the furrow formed. The soil moved in forming the next furrow covered the seed. The seed rate is not quite clear; but if the cost is taken as a guide, then 41 lbs. of husked nuts per acre were used, which is a low rate The crop was ripe in January. It was bullock-hoed once, hand-weeded twice and watered twice. The value of the fodder is not estimated.

The crop was harvested by women following a plough and collecting the nut turned up.

Mr. G. W. Scott, District Deputy Collector.

Several inaccuracies and omissions occur in this officer's groundnut test, which would have been avoided if the results had been tabulated in the usual form. Several points are left to conjecture. The weight of fodder is under estimated. A good crop of groundnut will yield much more than 788 lbs. per acre, and this product has a considerable value, though not always marketable.

Another experimenter (Mr. Doderet) values the by-products from a similar groundnut crop in Sholápur at nearly 5½ rupees per acre.

The field on which Mr. Scott's experiment was conducted is irrigable from a well, the revised survey assessment just equalling the special water-rate; both amount to Rs. 2-9-6 per acre.

The crops grown during the three previous years were bájri followed by two successive crops of jowári. The yield of principal product (3,873 lbs. per acre) is considered an average or 16-anna one. This represents the weight of nuts in shell immediately after being dug, but the experimenter should have taken the weight after the nuts were properly dry. Thus the yield as stated is higher than it ought to be. One lb. (39 tolas) of unshelled nuts (shenga) gave 29½ tolas of clean kernel (dáné). The seed was drilled with a four-coulter drill in June. The seed rate (93 lbs. per acre) is above that of the formulæ. The cultivation was good. The gross outturn, if the figures are accurate, exclusive of by-products, is valued at Rs. 84-4-4 per acre, a return which reduces the percentage incidence of assessment to a low figure.

SOUTHERN DIVISION.

Belgaum.

Only two ordinary crop experiments were received from the district, one from Mr. Sheppard and the other from Mr. DuBoulay. Two other officers, Messrs. Rand and Chitnis, report that they were debarred from conducting experiments this year by other duties. Mr. Rand's explanation is not considered satisfactory by the Collector, but Mr. Chitnis has shown reasonable cause for his failure to experiment.

Mr. W. D. Sheppard, Assistant Collector.

Mr. Sheppard's experiment on rice is useful, although the information conveyed is not correct in some details. Standing orders have not been strictly adhered to. The rotation is continuous rice as a principal crop, with pulse, either lentil or gram, as a second or cold-weather crop. The crop experimented on was drilled directly, not rábed and transplanted. The season was favourable and the land fairly manured. 27 lbs. seed, as the quantity sown per acre, is much under-estimated. At least twice that quantity would be required to produce a full crop if drilled. The date of sowing is not given.

The experiment proves that good black land fairly manured, in a favourable season with sufficient rainfall, can produce a remunerative crop of rice without transplantation. The yield points to at least fair cultivation, but the experimenter says it was indifferent, though not explaining in what respect.

Mr. J. H. DuBoulay, Assistant Collector,

Submits one ordinary experiment (No. 52), his first attempt, in sugarcane. The test is carefully conducted and reported. The variety under test was 'rasdáli,' grown in a mixed soil, manured with 50 cart-loads of cow and sheep manure and irrigated by a double *mot* from a well and adjacent nála. The yield is locally estimated at 13 annas (3,720 lbs. according to the formulæ), while the actual yield is still better and gives an acre rate of 4,847 lbs. of gul. The by-product, though useful as fodder, was not weighed by the experimenter, because it could not be sold in the local market. The approximate value of the tops is, however, recorded and included in the column of total value of produce. The rate of seed (1,500 sets per acre) is much below the mark. The price of gul per rupee in lbs. is not noted in the return as required, but the experimenter records the local rate as Rs. 15 per 8 local maunds of 52 sers of $\frac{1}{2}$ pound each. This gives a rupee-rate of $13\frac{13}{15}$ lbs.

Bijapur.

Mr. Divátia and Mr. Deshpánde have sent only one test each, accounting for the deficiency by press of Census work.

Mr. N. G. Deshpánde, District Deputy Collector,

Has expended a good deal of time and trouble on the experiment reported. He details the previous cropping of the experimented area for 5 years. This does not show any defined rotation, but it indicates that the cultivator knows the advantage of varying his crops, and the rotation is probably influenced by the character of the season.

Thus, in 1886-87 the whole field (16 acres) carried kharif crops, in 1887-88 the same area was under rabi, in 1888-89 kharif crops occupied 10 acres and rabi about 6. In 1889-90 the same proportion prevailed. This year 6 acres were sown with niger. The cropping of the other portion is not mentioned. The staple crops are jowári, bájri, cotton and niger. It is uncommon to find niger seed grown alone. The experimenter says he found several large fields growing *only* niger seed, and says the selected area carried a crop which was average for the season. The conditions of cultivation are so abnormal that the experiment is not of much value, but it may prove useful to show how unprofitable an average crop of this kind grown alone may be, when the season

is unfavourable. The land was well tilled and clean. No manure was applied. Want of rain prevented sowing until the middle of September, the usual time being a month earlier, and absence of rain later seriously affected the yield. A miserably poor return of 55 lbs. principal product per acre gives a gross money return of Rs. 1-10-3. The by-products have no marketable value. The local estimate, 7 annas, is much too high.

Mr. N. B. Divátia, Assistant Collector.

Mr. Divátia's experiment was conducted on safflower. In an 8-guntha area, 7½ gunthas was under wheat and ½ guntha under safflower. Wheat, the principal crop, was omitted, and the test was confined to the secondary crop, and that a poor one, locally estimated at 4 annas. The yield per acre is worked out to 754 lbs., value Rs. 12-15-0, showing a moderate percentage incidence of 8·49. But the test area being far below the prescribed minimum, the figures are untrustworthy and the experiment unfit for record. I have therefore excluded this experiment, which was mere wasted labour owing to disregard of standing orders.

Dha'rwa'r.

The programme settled for this district has not been followed, only one (mixed crops) out of four crops selected having been made the subject of test by the three experimenters reporting.

Mr. C. P. B. Wiltshire, Assistant Collector,

Sends two ordinary experiments. In each case the crops grown were jowári with subordinate row crops of green gram and kidney-bean. The results may, therefore, be contrasted. Barring a distinct variation in the character of the soils of the two test areas and a decided difference in the quantity of seed used, the conditions of cultivation were analogous. The season was unfavourable, the tillage good.

In the first experiment (No. 54), a black soil growing cotton and jowári in alternate years and manured with a light dressing of cowdung (only four loads per acre) yielded—

	Lbs. per acre.
Jowári	... 729
Gram	... 66
Kidney-bean	... 60

This land is assessed at Rs. 2-15-0 and the incidence of assessment on gross value is nearly 11 per cent.

In the second experiment (No. 55) the crop was grown from 6 lbs. jowári seed with 3 lbs. green gram and 3 lbs. kidney-bean per acre, just double the quantities sown in the other area. The soil is brown loam, assessed at Rs. 2-1-9. The experimenter hazards the explanation that this class of land requires more seed than the other, but it appears to me that an excessive quantity of seed was sown. The jowári grew so luxuriantly that the row crops were choked. Seven cart-loads of dung and fodder refuse were applied per acre in June. Both crops were sown in July and harvested at Christmas. The yield in this case was—

	Lbs. per acre.
Jowári	1,413
Gram	17
Kidney-bean	2

bearing, with the by-products, a gross value of Rs. 37-13-0. In this experiment the kadbi was valued at a lower rate than in the first, because the stalks were coarser and more woody.

Mr. R. E. Kanga, District Deputy Collector,

Forwards two carefully conducted tests on cold-weather jowári mixed with green gram in one and linseed in the other. They are interesting, as the fields selected are of the same quality and bear the same rate of assessment. Both

were carefully cultivated, the only difference being that in the second experiment no manure was in the ground, while in the first the field was manured three years ago. Field in the latter case was sown with $3\frac{1}{2}$ lbs. of jowári and $6\frac{1}{4}$ lbs. of green gram per acre, while in the former $19\frac{2}{3}$ lbs. of linseed with $2\frac{1}{5}$ lbs. of jowári was sown. In the first, which shows a good yield for jowári (more than 3 times the yield in the second), the latter probably smothered the pulse. The experimenter attributes this to irregularity of rainfall, which, he says, was sufficient in one part and deficient elsewhere in the same village. The seed rate has, however, a good deal to do with this, and the date of sowing in relation to the rainfall, as well as the manure left in the soil. Both experiments, however, were conducted and reported with care and attention to standing orders.

Mr. Sorábji Padamji, Assistant Collector.

One test on kharif jowári mixed with tur and mug in rows. The pulses being not ripe when the test on jowári was taken, Mr. Sorábji was unable to complete his report before his transfer to the Ahmadnagar District, and asked the Mámlatdár of Karajgi to furnish the necessary information on the supplementary crops tur and mug, which, however, could not be done. The experiment is carefully worked out as far as it goes, but I must exclude it as the details are open to doubt owing to the omission of the row crops.

Kolába.

Two carefully executed experiments on sweet rice by Mr. Pratt, Assistant Collector, are forwarded from the Kolába Collectorate. The District Deputy Collector, Mr. Bhángaonkar, who joined the district about the middle of March, says he was debarred from conducting any experiments owing to pressing revenue and other duties.

Mr. E. M. Pratt, Assistant Collector.

Greater interest would have attached to Mr. Pratt's tests if he had been able to carry out his original programme, viz., to complete his rice experiments and gain further information by making a test on vál, the secondary crop grown after rice in each of the fields. His transfer to another district rendered this impossible.

A parasitic grub, which infested most of the rice fields of the Alibág coast, did not do sufficient damage to vitiate results. The land that was most liberally manured suffered most. There is very little difference between the yields, and each may be classed as a bumper crop.

In the first experiment (No. 58) the crop was grown from seedlings planted out in June raised in a seed-bed which had been manured with fish, but not rábed. The ratio of seed-bed to transplanted area was in the proportion of $5\frac{1}{2}$ gunthas to an acre. The land where the crop matured was not manured, but it receives drainage from the village site, which, considering that the field is very small may be all that it required. The experimenter describes the soil as deep and good and almost too rich to grow rice. This land is assessed at Rs. 6-8-10 and produced a crop which yielded 2,586 lbs. grain and 3,680 lbs. straw per acre. 70 lbs. seed per acre was sown. The rainfall was abundant.

The second experiment (No. 59) was conducted in an adjoining field, where the soil is similar and assessed at about the same rate. The returns per acre are in this case a little less. The whole field was manured with fish manure, one cart-load per acre.

The seedlings were raised in a seed-bed on which ráb of leaves, grass and cowdung had been burnt. The size of the seed-bed was in the ratio of $4\frac{1}{2}$ gunthas to an acre transplanted. Probably the estimated damage done by the grub is too low in this case.

The percentage of incidence of assessment is not excessive (in each case about 11 per cent.).

The land grows rice continuously with a secondary pulse crop every year.

Ratna'giri.

Mr. E. McCallum, Assistant Collector.

Two experiments are reported by Mr. McCallum, First Assistant Collector. He has not adhered to standing orders, and errors have occurred in consequence in his results. The samples forwarded to this office were not correctly weighed by the experimenter, the difference between the weights recorded by him and those found in this office being too great to be accounted for by mere dryage.

This inaccuracy affects the gross weight of produce per acre, and, were it not that in other respects useful information is afforded, the experiments would be omitted.

A harik crop, estimated locally at 18 annas, gives a yield of 503 lbs., which with the by-product is worth Rs. 7-1-4.

Harik straw is valueless as fodder, but 1,703 lbs., the yield per acre in this case, is worth, for ráb purposes, more than Re. 0-6-8, which is the experimenter's estimate.

The crop in question was grown after nágli on upland level soil and was the second rotation crop after a five years' fallow, the usual practice being to complete the rotation by growing vari after harik, til after vari, and then again fallowing. The season was favourable and cultivation good. No manure was applied and the incidence of assessment on gross value works out 2·52 per cent. In considering this incidence it must be borne in mind that the land lies idle during long periods, when, as grazing land, it is not worth much. This remark applied to all warkas land.

Mr. McCallum's second experiment (No. 61) is on nágli. The seed was broad-casted in June (33 lbs. per acre) on land that had lain fallow for five years. The cropping in the previous rotation was in the following sequence: 1st nágli, 2nd vari, 3rd harik, 4th sarvati bhát (rice), followed by fallow. The yield per acre of 801 lbs. grain and 2,368 lbs. straw gives a value of Rs. 30-5-6 and an incidence of assessment of 1·18 per cent.

The experimenter estimates the total cost of cultivation per acre at Rs. 1-5-0. His figures are, however, insufficiently explained and are certainly too low.

Mr. L. N. Ajgaonkar, District Deputy Collector.

This experimenter enters into elaborate details of the cultivation of the coarse hill millets. I here analyse his narrative, extracting the facts that are of most interest and importance.

In the hill cultivation of the Konkan the main feature is the long period of fallow. If the land is good land it is left idle for at least 4 years, if of medium quality, 6 or 7 years, while, if it is poor, 10 years may elapse before it is again brought into cultivation. In the meantime such land affords grazing and grows scrub brushwood available for ráb and other purposes. When such land has sufficiently recovered, nágli usually takes the first place in rotation of cropping. On very good land nágli may follow nágli for one or two years. If the soil is medium or poor, varai occupies the land in the 2nd year, followed by harik and til in the 3rd and 4th respectively. Kulith or horse-gram is sometimes taken first.

Nágli is mostly grown from rabed seedlings. The experimenter also describes other methods of cultivation which are the exception rather than the rule. Thus he says nágli is grown in four ways :—

(1) The scrub growth on land which has long lain fallow is cut, distributed evenly over the surface and burnt. The seed is then sown broad-cast and ploughed in, or if ploughing is impracticable, the seed is covered by digging the soil with the *kudal*.

(2) Seedlings raised in a rábed seed-bed are planted out on land that has been three or four times ploughed. By the time the cultivator has the land in a fit condition for them, the seedlings are strong enough to transplant. The transplantation is managed in two ways :—

(*a*) In holes made 6 inches apart by a sharp pointed pole. The manure is applied directly to these holes. Sometimes decayed fish, mixed with ashes and sheep-dung, is used. Sometimes simply a handful of sheep or goat manure or a piece of dried fish. The seedling is inserted and the surrounding soil pressed down upon its roots.

(*b*) No manure applied. Each seedling is stuck into the soft soil, the roots being partially imbedded. This plan is only successful when there is a continued moderate rainfall. If excessive, the plants get washed away ; if there is no rain, the plants wilt and die.

(3) The seed is sown broad-cast on land that has been sufficiently tilled and manured, after lying fallow at least four years. In this case ploughing begins with the first fall of rain. It should proceed expeditiously, otherwise the crop will be late. The land is ploughed twice at least and manured with ashes or cowdung.

(4) The mode of cultivation next described is rather applicable to the preparation of the rábed seed-bed. Good land is selected or such as has been fallowed sometimes. Over the surface is evenly spread dried cowdung, then layers of lopped branch-wood (*kawal*), hay or harken (straw of harik), and finally fine sifted or pounded earth. The earth forms a layer about 2 inches thick, added in the early morning or at any time up to eight o'clock, when the dew still lies. Dew is of importance, and hence the months of March and April are selected.

The ráb heap should be fired on the afternoon of the day it is made and the earth should be burnt a dull red colour. On a seed-bed prepared in this way nágli seed is broad-casted when there are signs of monsoon rain or after the first showers. The land is then slightly ploughed and the clods broken and surface levelled with the Gutha or roller. A five-guntha seed-bed broad-casted with (practically) 12 lbs. seed furnishes sufficient seedlings to plant an acre. The crop is usually hand-weeded once late in August or early in September.

The experimenter forwards three experiments on nágli. In none of them was the crop raised from transplanted seedlings. Two of his experiments are on crops cultivated under like conditions. The season was favourable. A nearly equivalent value of manure was applied to each crop. The land in each case is assessed at about the same rate.

In the first experiment (No. 62) the cultivation is described as middling and the yield per acre (808 lbs. of grain) is about 58 per cent. of what it is in the second where the cultivation is described as good. Previous cropping has, however, to be considered.

In the 3rd experiment (No. 64) on nágli, the crop was cultivated in a different manner and it is interesting to compare results. It was the first crop taken after a five years' fallow. The whole area was rabed early in April, but in what manner is not quite clear. The probability is that what is called Kumri cultivation was adopted. The scrub growth over this area was cut, dried and burnt, possibly with the addition of other branch-wood and straw. It is hardly credible that the whole field extending to 5 acres was rabed in the manner already described for a rábed seed-bed as might be inferred from the experimenter's notes. This crop was ripe like those already referred to on 1st November and gave a yield of 1,650 lbs. grain per acre, having with the by-products a money value of Rs. 44-9-9, and showing a percentage incidence of assessment of only 0·89. Nágli requires to be stacked and kept unthreshed for some time, at least one month.

In his 4th experiment (No. 65) Mr. Ajgaonkar describes in detail the cultivation of vari. Seedlings are raised in a rábed seed-bed, $5\frac{1}{3}$ lbs. of seed on a 7 guntha seed-bed furnishing sufficient seedlings to plant an acre. The land is 3 or 4 times ploughed during the first three weeks of rain. Vari usually follows nágli and is not manured, the manure applied to the preceding crop being sufficient. The crop is commonly twice weeded, once about the end of August

and again a month later. The straw of vari is not used as fodder, and as it has no other economic value except for having as ráb, the cultivator usually leaves a long stubble in reaping.

The results of this experiment and of the next, also on vari, can hardly be subjected to comparison, because the conditions of cultivation differed. In both cases the incidence of assessment on gross value is small. The first experiment shows a yield 566 lbs. grain per acre—considerably under the formulæ for a 18-anna crop. The crop was ripe on the 5th November. This was the third rotation crop taken since fallow. As regards the second vari test, the experimenter makes the remark that the crop was reduced to a 16-anna one, because the seed was sown late, but he gives no date. The returns are less favourable than in the first test, but the cultivation was poorer.

The results obtained by this officer's two experiments on harik can be contrasted with advantage. The first test was on an upland sloping land that had lain fallow for ten years. The crop in question was the third crop taken, the two previous ones being kulith followed by nágli. The cultivation is described as good. The season was, however, unfavourable. The incidence of assessment on total value of produce is low, only 4·32 per cent. The second experiment was conducted on upland level land called *bhátli* or mál land in contradistinction to the upland sloping soils which are termed *dongri*. In this case the crop experimented upon was the second crop after fallow. There is only a small difference in the assessment levied. But in this experiment the grain yield per acre was 112 lbs. better than in the other or about 17 per cent.

In the experimenter's supplementary notes some general remarks are offered on the cultivation of harik. About 61 lbs. seed is sown broad-cast per acre in third week of June. Two ploughings will suffice if the land is clean, 3 or 4 if the land is foul. No manure is applied. The crop requires one weeding only. It ripens early in November. After harvesting it is allowed to lie in the sun to dry for nearly a week, and thereafter is stacked on a *mách* (rick stool) to mature the unripe ears.

The experimenter alludes to a well-known fact that the straw of harik (sometimes the grain also) contains a poisonous principle which makes it dangerous as a food for stock.

Mr. Ajgaonkar deserves credit for his seven careful and valuable tests.

Ka'nara.

Mr. C. W. Hudson, Assistant Collector.

A good experiment on sugarcane is reported by Mr. Hudson. The crop was grown on rice land, which is also evidently well suited for sugarcane. Irrigation is provided by a stream, which runs through the area experimented upon. The assessment of Rs. 4 per acre seems low.

The details of this experiment are sensibly worked out, and afford a good deal of useful information. The experimenter does not say that the test was conducted throughout under his personal supervision. I do not, however, question his figures. They are generally in accord with authentic records of previous years. I cannot, however, accept the local estimation of the crop as correct; 14 annas is too low.

The season was favourable and facilities for irrigation were all that could be desired. The quantity of cowdung applied per acre is incorrectly stated at 102 cart-loads. The figures show 72 loads to be the right number. Leaf ash of undefined quality and quantity was also used. Altogether about 30 tons manure per acre was given. This is by no means a heavy application for sugarcane, yet the resulting crop was a capital one. The experimenter shows the gross value of gul per acre to have been Rs. 362-10-6. This does not represent the full value of gul that might have been obtained; for when the canes were topped, a piece from the top of each of the larger sized canes was cut off for replanting. This is a growing and economical practice. The sets are valued at

Rs. 2 per thousand. The experimenter calls them seed sticks and shows the proportion of canes capable of yielding them.

Total number of canes found growing on 4 gunthás ...	... 4,241
Number of canes that furnished seed sticks ...	... 3,471

The experimenter omits to value the green tops. They are not considered of great value by the cultivators. Those from an average crop will weigh, before they wilt, 8,000 to 9,000 lbs. per acre, and are commonly all consumed by the bullocks that work the cane mills. Tops are often taken as a perquisite by the owners of such bullocks when the expressing the juice and making the jagri is done by contract.

The approximate gross value of yield is shown as under :—

	Value per acre. Rs.	a.	p.
Gul 7,614 lbs. at 21 lbs. per rupee	362	10	6
34,710 sets, at 2 rupees per thousand	69	6	8
Tops	10	0	0
Total ...	442	1	2

The cane yielded 69·2 per cent. juice and 13·8 per cent. jagri.

The incidence of assessment is very low (nearly 1 per cent.). In the experimenter's explanatory notes he briefly describes the cultivation of the crop which was planted in March 1890 and took practically 11 months to mature. Very little manure was applied before planting. Dried leaves stripped from a previous crop and refuse crushed cane were spread over the surface, allowed to dry and then burnt, and a little cowdung was added. A month later, when the cane shoots were vigorous, a heavy dressing of cowdung was incorporated with the soil by digging between the rows and earthing up the cane.

In July the area was weeded and the canes wrapped. Subsequently these operations were repeated twice at intervals of a month.

Mr. Hudson's second experiment (No. 70) is on hot-weather rice in well cultivated and liberally manured garden soil. It is irrigated from a nála and grows monsoon and hot-weather rice every year. The season was good and the yield locally estimated as full average. There is no formulæ, for hot-weather rice, but according to experiments made in Kánara between 1873 and 1878 the average yield varies from 2,000 to 2,400 lbs. the acre. The actual yield in this experiment is 2,220 lbs. the acre.

The field was leased on a crop share system to a cultivator who supplied all labour and half the seed, while the landlord supplied plough-bullocks, manure and the other half of the seed. The total cultivation charges for 34 gunthás of land are :—

	Rs.	a.	p.
By *landlord*—			
Cost of a pair of bullocks for 16 days for ploughing ...	4	0	0
Do. clod-crushing	0	4	0
Do. manure, 120 cart-loads at 60 cart-loads the rupee	2	0	0
½ seed	1	4	0
Total ...	7	8	0
By the *cultivator*—			
Ploughing, 1 man 16 days, at 1¼ annas per day ...	1	4	0
Clod crushing, 1 man 1 day	0	1	3
Spreading manure, 12 men 1 day, at annas 2 per day ...	1	8	0
Carried over ...	2	13	3

	Rs.	a.	p.
Brought over ...	2	13	3
Cost of half the seed (Rs. 1-4-0) and of sowing... ...	1	5	0
Transplanting	1	11	0
Annual repairs to the nála	0	6	0
Watering, 8 days of 6 hours, at 2 annas per day—1½ hours a day once in 3 days—30 watering days of 1½ hours each.	1	0	0
Reaping	0	10	0
Threshing, &c., 5 men at annas 1¼ per day—1 day ...	0	6	3
Watching	1	14	0
Cultivator's cost	10	1	6
Landlord's do.	7	8	0
Total ...	17	9	6

	Rs.	a.	p.
Value of 1,887 lbs., the yield of 34 gunthás under rice ...	34	13	2
Landlord's share	17	6	7
Deduct—Cost	7	8	0
Net produce ...	9	14	7

	Rs.	a.	p.
Cultivator's share	17	6	7
Deduct—Cost	10	1	6
Net produce ...	7	5	1

Thus the landlord, who has to pay the assessment Rs. 2-8-0 on the field, gets Rs. 7-8-0 net. The cost estimated as incurred by the cultivator represents mostly the value of labour supplied by himself and his family.

	Rs.	a.	p.
The total value of gross produce is per acre	40	15	6
Assessment...	2	15	0
Percentage incidence of assessment on gross produce ...		7·17	
	Rs.	a.	p.
Net produce after deducting the total cost, Rs. 20-11-2, per acre	20	4	4

The percentage incidence on the net produce (14·49) is not high, considering the fact that the kharif crop was left out of account.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Ta'luka, village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	AHMADABAD.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. G.
	Mr. H. O. Quin, Assistant Collector.										
1	Daskroi (Khokra-Mehmadabad).	Rice (Sutarsál), 31st October 1890.	14	1,840	18	1,564 (in husk.)	...	39 1 7	6 2 5 water-rate included R. S.	15·73	0 4
2	Do. (Dani Limbda) ...	Do. 5th November 1890.	13	1,700	34	773 (in husk.)	...	19 5 2	3 4 8 R. S.	17·03	0 4
	Mr. J. K. N. Kábráji, Assistant Collector.										
3	Viramgam (Viramgam) ...	Cotton, (Vágadia), 7th January and 5th February 1891.	14	370	18	371½ cotton pods.	...	18 14 3	1 13 0 R. S.	9·59	0 20
	Mr. E. Maconochie, Assistant Collector.										
4	Sánand (Mátoda)	Rice (Kamod), 25th November 1890.	16	1,950	24	987 (in husk.)	2,050	44 9 3	6 4 0 including water-rate O. S.	14·00	0 4
	KAIRA.										
	Mr. J. W. A. Weir, Assistant Collector.										
5	Ánand (Ánand)	Rági (Bávto), 25th October 1890.	16	1,650	8	1,230	900 straw, 340 bháre.	34 2 3	4 14 8 O. S.	14·40	0 8
6	Do. (do.)	Kodra, 25th October 1890.	16	1,425	15	1,993	2,400	32 0 0	5 8 0 O. S.	17·18	0 10
7	Do. (Boriávi)	Rice (Jirásál), 16th November 1890.	16	1,950	...	3,118 (in husk.)	5,000	109 12 0	7 1 3 O. S.	6·44	0 10
	Mr. Motilál Chunilál, District Deputy Collector.										
8	Mehmadabad (Areri) ...	Rági (Bávto), 21st October 1890.	10	850	8	908 bávto.	298 bari, 1,834 straw, 75 gotar.	24 12 5			
		Kindney bean (Math), 29th January 1891.	8	15	1	15 math.		0 9 5	3 13 3 O. S.	15·06	0 34
								25 5 10			
9	Do. (Mehmadabad).	1 'Kodra' 9th October 1890, mixed with.	20	800	12½	985	1,304	22 8 0			
		2 Pigeon Pea (Tuver), 8th February 1891.	20	270	4 1/16	265	232	6 14 0	4 0 0 O. S.	10·72	0 10
		3 Sesame (Tal), 9th October 1890.	19	130	⅔	130	...	7 15 0			
								37 5 0			
	PANCH MAHALS.										
	Mr. A. F. Maconochie, Assistant Collector.										
10	Godhra (Gadh)	Maize, 19th September 1890.	8	560	26	825	1,650	19 1 10	0 10 4 O. S.	3·37	0 8

Northern Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwt.	
Weight. Ser= 40 tolás.	40	...	*Experiment No. 1* :—Light clay soil (goradu) not properly rice land, but under irrigation from a well; grows rice as a kharif crop, followed by barley in years of good rainfall. This year barley not sown, well water being required for sugarcane elsewhere. Cultivation indifferent but season fair. Manured two years ago at 20 cart-loads the acre and this year sheep allowed to graze over the land. The seed was first sown in a $5\frac{1}{5}$ gunthás seed-bed at 18 lbs. the acre of transplanted area. Straw omitted in this and the following experiment. Incidence in column 11 high being on the kharif crop only, which suffered from the year's dificient rainfall.
Do.	40	...	*Experiment No. 2* :—Rice in a similar but less fertile soil irrigated from Chándoli Canal and growing rice, except in years of bad rainfall, when jowári is substituted for rice. Unmanured and badly cultivated. Season fair. The rate of seed 34 lbs. the acre high. Compared with Experiment No. I, bad cultivation and inferiority of soil is said to account for the low return.
Do.	20 cotton pods.	...	*Experiment No. 3* :—Vágadia cotton on a dry-crop, black soil, growing in alternate years, jowári and cotton. Manured before sowing in May—June at 5 cart-loads the acre of cow-dung and fodder refuse. Cultivation good and season favourable on the whole to cotton crops in the locality. Cotton under experiment sold in pods and therefore by product not accounted for.
Do.	23	11	*Experiment No. 4* :—Rice (kamod) on *besar* or mixed black soil irrigated from a tank and growing in alternate years rice and wheat. Manured at $7\frac{1}{2}$ cart-loads per acre of cowdung and straw manure in June before sowing. Cultivation good and season fair. Rate of seed low for broad cast sowing compared with the formulæ seed rate. Incidence in column 11 moderate in spite of the suspiciously low yield.
Do.	$46\frac{7}{8}$	$1\frac{3}{7}$	*Experiment No. 5* :—Bávto raised from transplanted seedlings on good land locally called *Kiarinavi*. Season good and outturn good. Land manured with 10 loads cowdung and ordinary refuse; a low outturn of straw as compared with recorded weight of grain.
Do.	$66\frac{1}{2}$	$10\frac{5}{7}$	*Experiment No. 6* :—Kodra on land of like character, manured in the same manner; yielded well. The cropping during preceding three years was as follows :—(1) jowár, (2) kodra and tur, (3) jowár and math: percentage incidence of assessment seems rather high.
Do.	$31\frac{1}{4}$	$4\frac{1}{2}$	*Experiment No. 7* :—Rather highly assessed rice-land growing rice every year. Lightly manured this year. Cultivator tried a change of seed. Yield abundant. Crop irrigated from a private well.
Do.	41 bávto. $38\frac{1}{2}$ math.	1 bari. $3\frac{5}{8}$ gotar.	*Experiment No. 8* :—Rági with a small admixture of math, grown on a good soil (locally *goráda*). Manured by folding goats in June. Land usually cropped with the coarser millets and a pulse mixture, but sometimes jowár and rice grown with subordinate rows of pulse. The rági was grown from transplanted seedlings.
Do.	$46\frac{6}{7}$ $51\frac{9}{20}$ $16\frac{2}{5}$	$7\frac{3}{4}$ 1 ...	*Experiment No. 9* :—Kodra with subordinate rows of tur and sesame produced on good land in a favourable year a capital crop. The field was well cultivated and manured with 9 cart-loads per acre of farm yard manure applied in June. The seed was drilled in July. The land was cropped during the last three years with successive kharif crops of bájri and mixed pulses. Same soil as in preceding experiment.
Do.	49	$6\frac{1}{4}$	*Experiment No. 10* :—Maize on an unirrigated *besar* or mixed soil growing annually maize (kharíf) and gram (rabi). Manured at 11 cart-loads the acre in May. Cultivation indifferent; season fair. Land foul with '*chida*' grass. Not a good test on this account.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	PANCH MAHA'LS—*contd.*										
	Mr. A. F. Woodburn, Assistant Collector.										
11	Godhra (Gadh)	Gram (Pilachana), February 1891.	20	1,100	125	590	345	20 10 0	0 10 4 O.S.	3·17	0 8
	Mr. Pránlál Harkisandas, District Deputy Collector.										
12	Dohad (Gámla)	Rice (Sutarsál), 18th October 1890.	11	620	74½	969 (in husk.)	1,400	23 11 2	3 2 11 O.S.	13·42	0 8
13	Do. do.	Wheat (Vájia) and Gram (Rata chana), 12th March 1891.	4	210	93	128	250	3 14 0	3 2 11 O.S.	62·09	0 8
			4	90	56	51	85	1 4 0			
								5 2 0			
14	Jhálod (Nánsalái)	Rice (Sutarsál), 20th October 1890.	13	730	87	1,364 (in husk.)	2,025	31 12 0	2 3 9 O.S.	7·03	0 4
15	Do. do.	Wheat (Vájia), 16th March 1891.	10	840	68	884	846	25 13 7	2 3 9 O.S.	8·64	0 4
	BROACH.										
	Mr. S. L. Batchelor, Assistant Collector.										
16	Jambusar (Jambusar) ...	Cotton (Deshi) 3rd January to 28th February 1891, 7 pickings.	14	370	6⅔	590 seed cotton.	...	51 0 3	6 12 0 O.S.	13·29	0 8
	Mr. Sorábsha Hormasji and Mr. Chunilál Venilál, District Deputy Collectors.										
17	Ankleshvar (Ankleshvar) ...	Cotton, 20th January to 1st March 1891, 4 pickings.	12	340	9	362 seed cotton.	...	28 5 4	4 3 9 O. S.	14·94	0 8
	SURAT.										
	Mr. Syad Nurud Din Khán, Assistant Collector.										
18	Bulsár (Abráma)	Sugarcane (Khajurdi), 4th to 6th December 1890.	14	4,260	1,800 whole canes.	8,584 gul.	22,760 tops and leaves.	550 4 8	12 1 11 Including water rate. O. S.	2·20	0 5
19	Bulsar (Párdi Haria)	Do. (Malbári), 9th to 11th December 1890.	13	3,960	1,800 do.	8,718 do.	14,456 do.	591 6 0	12 6 9 Including water rate. O. S.	2·10	0 5

Northern Division, 1890-91.—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices or Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
Weight. Ser= 40 tolás.	30⅛	2⅜	*Experiment No. 11.*—Gram following maize in the above experiment. Manured for maize, but not for gram; the *chida* grass in the field, though detrimental to maize, not so to gram. Season favourable. Rate of see high compared with the formulæ rate of 50 lbs. per acre. Percentage incidence of assessment on the year's gross produce, as shown in the two experiments 1·62. Gram sown only in one-fourth area of the field.
Do.	45⅝	5	*Experiment No. 12.*—Soil, *Bhuri* or *gorádu*, light brown growing rice, wheat and gram. Manured at 11 cart loads the acre. Cultivation fair; season unfavourable on account of failure of September rains. Compared with formulæ, yield high.
Do.	35⅝ wheat. 45⅝ gram.	8⅜ 5⅝	*Experiment No. 13*—Wheat mixed with gram on the above soil. Not manured for the second crop. Cultivation fair; moisture left in the soil after rice taken off insufficient and crops damaged by frost. Yield there fore poor. Rate of see d high compared with the formulæ rate per acre (70 lbs. for dry-crop wheat and 50 lbs. for gram). Incidence in column 11 being on poor second crops after rice is only apparently high. Percentage incidence on year's gross produce in Experiments Nos. 12 and 13,—11·04.
Do.	49⅜ (in husk)	4½	*Experiment No. 14*—Rice *sutarsál* on a good *gorádu* soil growing rice and wheat. Manured at 3 cart-loads the acre beforesowing. Cultivation good. Season unfavourable to rice crops in general on account of scanty late rains, but favourable to this crop; the field being on a lower level and consequently holding greater moisture than others in the locality.
Do.	35⅝	7⅝	*Experiment No. 15.*—Unmanured and unirrigated wheat on the same soil after rice. Cultivation good. Season fairly favouable. Compared with Experiment No. 13, yield good, and the incidence in column 11 on the second cropr, light. Percentage incidence on year's gross produce—3·87.
Do.	11½ seed cotton.	...	*Experiment No. 16.*—Indigenous cotton on a light brown soil locally called *Marugorát* growing bájri and cotton. Unirrigated but manured before sowing in June at 12 cart-loads the acre. Cultivation indifferent and season a little below average; rains slightly deficient and the crop slightly affected by cold in February. Compared with the formulæ, yield good, but rate of seed below the formulæ rate of seed per acre, 10 lbs. Proportion of seed to clean cotton not recorded.
Do.	12⅜ seed cotton.	...	*Experiment No. 17.*— Do. do. Unmanured but left fallow for 3 years. Cultivation good and season as in the above experiment. Compared with the experiment at Jambusar above, yield in column 7 low.
Weight. Ser= 37	16⅞ gul.	4⅝	*Experiment No. 18*:—Sugarcane of *Khajurdi* variety on *gorádu* soil, irrigated from a well, liberally top dressed with soil from adjoining rice land. Manured with ordinary manure 30 loads per acre before monsoon, then broad casted with hemp which was ploughed in as green manure. Cultivation good and season excellent.
Do.	15⅛ gul.	7⅜	*Experiment No. 19*:—*Malbári* sugarcane (a variety of the Mauritius sort) yielded well considering that no manure was applied directly to the crop. The preceding rice crop was liberally manured—66 loads per acre having been applied. The land was well tilled and season favourable.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	SURAT.—*continued.*			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A.
	Mr. Syad Nurud Din Khan, Assistant Collector—contd.										
20	Bulsár (Sonváda)	Peas (Vatána), 30th January 1891.	12	480	40⅔	588	768	17 9 3	2 14 6 O. S.	16·53	0 8
21	Do. do.	Vál (Kadva), 4th March 1891.	10 to 12	450 to 530	58	370	811	15 0 0	2 12 3 O. S.	18·43	0 8
22	Párdi (Dungra)	Gram, 18th February 1891.	12	480	71	408	142	13 12 0	0 11 0 O. S.	5·00	0 8
23	Do. (Karáya)	Castor (Diveli), 21st February 1891.	12 to 14	340 to 390	43⅔	455	...	17 15 11	0 11 5 O. S.	3·99	0 8
	Mr. E. Maconochie, Assistant Collector.										
24	Jalálpor (Hansápur)	Sugarcane (Vánsi), 3rd February 1891.	16	5,250	1,777 whole canes.	5,230 gul.	6,480 green tops.	311 10 6	14 10 9 water-rate included. O. S.	4·52	0 4
	Mr. D. N. Nánávati, District Deputy Collector.										
25	Chorási (Kapletha)	Vál, 14th March 1891.	16	675	76½	1,732	2,070 chaff 1,605 stalks.	50 13 9	10 5 10 O. S. with water-rate. 19 0 4 O. S.	20·37 37·39	0 4
	Mr. Umedrám Ranchordas, District Deputy Collector.										
26	Bárdoli (Suniva)	Wheat (Hánsia), 16th February 1891.	12	730	66	1,129	1,433	45 3 9	3 14 6 O. S.	8·63	0 8
27	Do. (Bharampur)	Do.	8	490	66	669	645	25 11 3	3 12 7 O. S.	14·73	0 8
	THANA.										
	Mr. R. M. Kennedy, Assistant Collector.										
28	Sálsette (Dánda)	Rice (Garve, Durku) 22nd October 1890.	20	2,000	30	3,282 (in husk).	7,545	91 12 0	6 1 6 O. S.	6·64	0 8
29	Bassein (Mulgaon)	Salt rice (Kudruk), 25th October 1890.	20	1,500	36	2,591 (in husk).	3,675	76 11 6	4 3 4 O. S.	5·48	0 8
	Mr. J. P. Orr, Assistant Collector.										
30	Karjat (Kaloti Ryati Khálápur Peta).	Sweet Vál, 25th April 1890.	20	400	62	1,195	870 chaff 1,334 stalks.	33 5 0	6 1 10 R. S.	18·35	0 9

Northern Division, 1890-91—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
Weight ser =37 Tolás.	46½	1⅜	*Experiment No. 20.*—Peas grown as a late rabi crop on a tank number which early in season held water sufficient for irrigating adjoining land. When the water subsided the peas were sown. This land is principally cropped with peas; but kodra, castors and gram, are occasionally grown. The season was favourable, but the cultivation indifferent.
Do. ...	37	1½	*Experiment No. 21.*—Vál grown under similar conditions to last test. Yield poor and incidence of assessment high; for each of which results indifferent cultivation is partly accountable.
Do. ...	30 5/13	4	*Experiment No. 22.*—Gram sown after a year's fallow on black soil previously exhausted, but which grows usually castors once in two years. Season favourable. Cultivation good and outturn fair.
Do. ...	25⅔	...	*Experiment No. 23.*—Black soil growing castors as a secondary crop to rice. With indifferent cultivation and a good season the incidence in column 11 is apparently too low.
Do. 37½	18	2⅔	*Experiment No. 24.*—Sugarcane on a black clay soil irrigated from a well and tank, and growing rice as *kharif* and vál as *rabi* crop for 3 continuous years followed by sugarcane in the 4th. Manured with cowdung every year before the rains for rice at 4½ cart-loads the acre, and for sugarcane after planting with oil-cake at 29 local mds. or 1,115 lbs. the acre. Cultivation good and season only average as failure of late rains and consequent early drying of the tank caused the canes to be smaller than they would otherwise have been.
Do. 37¼	57	1 chaff 5½ stalks.	*Experiment No. 25.*—Vál on a black soil usually growing rice as kharif and irrigated from a neighbouring well. Rotation every year rice followed by vál and oil-seeds. Manured for rice at 40 cart-loads the acre before the commencement of the monsoon. Cultivation good and season favourable to vál, which required no irrigation. Compared with the formulæ (40 lbs. the acre) the rate of seed in column 6 high. Figures reported as returned. Percentage incidence in column 11 high being on rabi crop only.
Do. 37	30	1 11/16	*Experiment No. 26.*—Black soil locally called *Morwan* and cropped with wheat, gave good returns. It has only been regularly tilled within the last 5 years; previously it was waste or grazing land. The effect of long fallow is observed. This land grows cotton, wheat and jowár.
Do. 37	30	1 11/16	*Experiment No. 27.*—Wheat on similarly classed soil did not yield so well as in the last test (No. 26) although the conditions of tillage and season were very much alike for both fields. Lack of manure accounts for high percentage of incidence in this experiment.
72⅞	44 1/10	3 9/10	*Experiment No. 28.*—A good black soil growing rice every year. Judiciously manured in May with 4 cart-loads cow-dung per acre and in July with 4 maunds fish manure. Good cultivation coupled with a favourable season tended to produce a bumper crop.
52¾	38½	3⅛	*Experiment No. 29*—Salt rice on black coast land also yielded well, though rather differently manured. To this crop there was applied in May 2 cart-loads of farm-yard manure, 1½ cart-loads crushed cane, and 1 load of ashes per acre, and to the same area in July 5 maunds of oil-cake.
76	39⅛	7½	*Experiment No. 30.*—Reddish soil (garwi) growing rice followed by vál every year. Neither manured nor irrigated. Cultivation good, and season excellent for vál. Compared with the formulæ, yield high; incidence in column 11 is on the second crop only.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yeild of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KHÁNDESH.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. W. H. Lucas, Assistant Collector.										
31	Sáwda (Sáwda)	Wheat (Bansi) irrigated. 5th February 1891.	10	420	58⅔	889	1,176	34 14 0	1 15 9 R. S.	5·69	0 10
	Mr. Kazi Kamruddin, District Deputy Collector.										
32	Dhulia (Narval)	Sesame (Til) 8th October 1890.	12	350	12	210 seed.	...	12 0 0	0 7 4 O. S.	3·81	0 20
33	Amalner (Lon)	Linseed, 7th February 1891.	12	250	12	276 seed.	...	12 4 6	1 0 4 R. S.	8·31	0 20
	NÁSIK.										
	Mr. H. F. Silcock, Assistant Collector.										
34	Málegaon (Dayáne) ...	Linseed, 27th January 1891.	12	250	8⅔	215 seed.	...	10 6 3	1 5 10 O. S.	13·13	0 8
35	Do. do.	Do. ..	10	155	8⅔	155 seed.	...	7 3 10	1 11 2 O. S.	23·45	0 8
	AHMADNAGAR.										
	Mr. Sorábji Padamji, Assistant Collector.										
36	Kopargaon (Kokamthán) ...	Dry-crop wheat (Báksi) 10th March 1891.	12	~~500~~	48	675	450 chaff 1,400 straw.	25 7 6	1 5 2 R. S.	5·19	0 8
	Mr. R. B. Stewart, Assistant Collector.										
37	Nágar (Walki)	Jowári (Bedri) and Kardai 15th January 1891.	14	715 60.	8⅘ jowári. 28 tolas kardai.	172 5	360 kadbi. 31 chaff.	5 12 6 0 2 6 5 15 0	1 0 3 R. S.	17·10	0 8
38	Párner (Narayen Gaván) ...	Gram, 17th February 1891.	16	480	76	482	...	10 5 0	1 12 3 including water-rate. R. S.	17·12	0 8
	Mr. V. B. Vadekar, District Deputy Collector.										
39	Karjat (Kuldharan) ...	Jowári (Dagdi) and	16	825	4	664	2,080 kadbi 280 chaff.	18 12 0	0 5 11 R. S.	1·76	0 10
	POONA.	Kardai ...	16	90	1	96	112	2 4 0			
	Mr. E. L. Cappel, Assistant Collector.							21 0 0			
40	Khed (Kasba Khed) ...	Potato. 4th March 1891.	~~10~~	~~5,740~~	1,906	10,940 tubers; of these 6,920 best 2,800 seconds 1,220 thirds.		118 8 8	5 4 2 R. S.	4·43	0 4

Central Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
143	29⅛	2⅔	*Experiment No. 31* :—Partially irrigated wheat *bansi* on a first class black soil, growing jowári and cotton in rotation with wheat. Manured three years since with cowdung and ashes at 5 cart-loads the acre, and evidently in need of more. The owner paid Rs. 6-4-0 per acre for use of a well. This would have been a wise expenditure if a liberal application of manure had also been given.
114	17 7/13	...	*Experiment No. 32* :—Middle class soil, *baradi*, growing til after two years fallow. Unmanured and unirrigated. Cultivation fair and season good. Yield compared with the formulæ poor, but the incidence in column 11 low. Seed rate high, compared with the formulæ.
117	22½	...	*Experiment No. 33* :—Linseed on black soil, neither manured nor irrigated, growing in rotation cotton, jowári and linseed. Cultivation average and season fair. Compared with the formulæ yield low, but the incidence in column 11 not too high.
120	20⅔	...	*Experiment Nos. 34 and 35* :—Good black soil, the cropping of which is regulated by the rainfall. If there is sufficient early rain, bájri is grown, if otherwise, the land is left for a rabi crop, which is usually jowári or linseed. This year's linseed unfavourably affected by irregular rainfall. These remarks apply to both experiments. Although the land in the 2nd experiment is of better quality than in the first, the yield is less because the seed was sown at a less favourable time.
120	21⅓	...	
117	33	1⅓ chaff. 5 straw	*Experiment No. 36* :—*Bakshi* wheat grown on a red sandy soil locally called *Kevta* as a 2nd crop after bájri. This land also grows jowári, tobacco and garden crops. Season unfavourable. Crop slightly affected by blight, apparently due to high westerly winds. Ten tolas' difference between weight of sample ser, as found in this office and as recorded by experimenter.
125	58 jowári.	1⅔ kadbi.	*Experiment No. 37* :—Jowári with kardai as subordinate crop on barad soil. Both practically a failure on account of scant rains, and land similarly cropped during the last five years. Incidence of assessment is necessarily high, and the local estimate in annas is reported ridiculously so.
...	32 kardai.		
114	47	...	*Experiment No. 38* :—Gram, irrigated from a well, grown as a 2nd crop after bájri on red land manured every 3rd or 4th year with 30 cart-loads ordinary manure. By-products not accounted for. Yield corresponds with formulæ. Seed rate very high. Incidence of assessment is calculated on the value of this crop alone. The previous bájri crop also grown this season not taken into account.
108	55⅓ jowári.	2⅔	*Experiment No. 39* :—Mixed jowári and kardai on brown barad soil, assessed at nearly annas 6 per acre and growing this mixture nearly every year, linseed being occasionally taken as a subordinate crop. This test is taken in connection with a special experiment which is fully commented on in the Analysis. (*See* pages 15-16.)
85	43 1/10 kardai.	16	
Weight ser— 76	80 best 112 seconds 172 thirds.	...	*Experiment No. 40* :—Potatoes on good deep black-garden soil growing during the last four years, bájri as kharif and potatoes as cold weather crops. Land irrigated from a well and manured with cow-dung &c., 22 cart-loads per acre. Well water scant owing to deficient rainfall. By-products only useful as manure. Anna estimate probably too low and seed rate too high. The gross value of outturn satisfactory, and incidence of assessment very moderate.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	POONA—*continued.*										
	Mr. S. R. Arthur, Assistant Collector.										
41	Indápur (Indápur)	Rabi, jowári (Máldándi and dagdi), 19th January 1891.	16	1,120	3¾	482	1,824 6 kadbi. 82 bhusa.	12 0 4	0 5 0 R. S.	2·60	0 10
42	Do. (Sansar)	Groundnut, 10th February 1891.	10	1,275	76⅜	1,172 nuts in shell.	...	27 13 10	0 4 4 R. S.	0·97	0 8
	Mr. J. W. Mollison, Superintendent of Farms.										
43	Haveli (Mundhwa)	Sugarcane, 28th January 1891.	18	5,400	2,383 canes, 6,498 lbs. nearly.	10,180 gul.	10,470 tops.	695 0 0	2 2 0 R. S.	0·30	0 4
	SHOLÁPUR.										
	Mr. W. Doderet, Assistant Collector.										
44	Sholápur (Vairag)	Groundnut, 12th February 1891.	17	3,400 nuts in shell.	125 clean nuts.	3,450 in shell. 2,507 shelled.	2,660	87 1 4	1 1 7 R. S.	1·26	0 4
	Mr. T. D. Fry, Assistant Collector.										
45	Mádha (Shetfal)	Groundnut, 7th February 1891.	16	3,200	97	2,540 nuts in shell.	4,200	66 7 4	0 13 3 R. S.	1·24	0 5
46	Málsiras (Málsiras)	Wheat (Jod), 5th March 1891.	11	630	75	915 in husk.	...	16 10 8	0 13 11 O. S.	5·21	0 5
	Mr. B. R. Heblihar, District Deputy Collector.										
47	Pandarpur (Shevate) ...	Rabi, jowári, 11th February 1891.	16	1,120	4⅘	340	840	7 8 0	0 11 1 R. S.	9·23	0 20
	SA'TA'RA.										
	Mr. G. D. Pánse, Assistant Collector.										
48	Válva (Peth)	Sugarcane. (Pandhra.)	18	5,400	16,000 sets.	11,312 gul.	...	757 1 4	3 10 2 O. S.	0·48	0 6
49	Do. do.	Groundnut, 21st January 1891.	17	3,400	...	4,124 nuts with shell.	...	103 1 9	1 14 7 O. S.	1·85	0 6
	Mr. G. W. Scott, District Deputy Collector.										
50	Khatáv (Katar Khatáv) ...	Groundnut, 13th February 1891.	16	3,200 nuts in shell.	93	3,873 nuts in shell.	788	86 12 4	2 9 6 R. S.	2·97	0 4

Central Division, 1890-91—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
101	67⅛	3⅜ Kadbi.	*Experiment No. 41.*—Cold weather jowári on mixed soil assessed at a low rate and probably poor land. The yield of kadbi is satisfactory, but that of grain is much less than the anna estimate represents. The land was not ploughed this season, and was unmanured except from the droppings of grazing cattle. The incidence of assessment very low.
Weight. ser=80 Tolas.	51¼ nuts in shell.	...	*Experiment No. 42.*—Groundnut on poor black stoney land under irrigation from Níra Canal. Manured with 25 loads ashes, sweepings, &c., per acre. Crop being irrigated, was unaffected by character of season. Returns poor and less than corresponding formulæ.
Do. 78	15	5⅛	*Experiment No. 43.—Pundya* or soft white sugarcane in a good black loamy soil, growing (1) sugarcane (2) ratoon and (3) fodder jowári in succession. The land fully and carefully irrigated from the Khadakvásla Canal and manured with poudrette (about 80 to 100 cart-loads per acre) mainly applied in January before the sets were planted. Actual yield nearly double the formulæ rate (5,400 lbs.) which may probably be due to the very liberal manure used and high class cultivation. Seed rate 5,000 canes according to formulæ. The value of tops included in column 9, but they are generally fed to cattle working the mill.
120	30¹⁹⁄₂₀ shelled nuts.	4¼	*Experiment No. 44.*—Good black garden land commanded by two wells, growing on the area under experiment, sugarcane, jowári, chillies and groundnut. The land was liberally manured and the returns are correspondingly good. Incidence of assessment very low. The seed rate is high and is the only doubtful entry.
43	41 nuts in shell.	...	*Experiment No. 45.*—Groundnut watered from a well grown on alluvial land, a brown friable loam, overlying sand at a depth of 18 inches. Season favourable. Cultivation indifferent. No manure applied with the memory of occupier. Incidence of assessment slight and yield about average.
92	56⅔ in husk.	...	*Experiment No. 46.*—Spelt wheat, irrigated, grown on friable black soil. Manured before seed time with 10 cart-loads dung and ashes per acre. Yield good for an eleven anna crop, but stated in husk not as clean grain. Incidence of assessment not high, considering this was a 2nd crop after jowári. By-product not weighed, but its value included in column 9.
144½	59	4⅔	*Experiment No. 47.*—This crop is supposed to have been an average one of the district. The seed rate is lower than the corresponding formulæ. The yields of grain and fodder are both disappointing, and this is more remarkable, as the season is described as good.
Weight ser =78 Tolás.	16 gul.	...	*Experiment No. 48.*—High cultivation of sugarcane under well irrigation on a good black soil in the Krishna valley, growing garden crops such as sugarcane, tobacco and chillies. Manured at 15 cart-loads the acre. Season good, and yield excellent. By-product though useful as green fodder, was not weighed, but its average value included in column 9.
Do. 78.	40 nuts with shell.	...	*Experiment No. 49.*—Groundnut on an excellant black soil as above. Irrigated from a well and manured with cow-dung at 6 cart-loads and by folding 120 sheep per acre, for 5 days. Cultivation good, and season on the whole fair. Compared with formulæ for a 17 annas crop yield very high.
32	46 nuts in shell.	5⅛	*Experiment No. 50.*—Groundnut on reddish soil, irrigated from a well, and manured this season with 12 cart-loads the acre. During previous three years a crop of bájri and two successive crops of jowári were grown Yield good, but figures doubtful, as principal product was weighed immediately after being harvested while yet in a wet condition.

Summary of Crop Experiment Reports,

O. S.=Original Survey

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	BELGAUM. *Mr. W. D. Sheppard, Assistant Collector.*										
51	Belgaum (Kudchi)	Rice (Antarsál), 27th November 1890.	16	1,600	27	1,615 in husk.	1,467	40 3 4 R. S.	4 13 11 R. S.	12·11	0 6
	Mr. J. H. Du Boulay, Assistant Collector.										
52	Gokák (Ankalagi)	Sugarcane (Rásdáli), March 1891.	13	3,720	1,500 sets.	4,847 gul.	...	358 14 0	2 6 0 R. S.	·66	0 4½
	BIJA'PUR. *Mr. N. G. Deshpande, District Deputy Collector.*										
53	Bágevádi (Bágevádi) ...	Nigerseed ... February 1891.	7	80	1½	55	...	1 10 3	0 5 9 R. S.	21·90	0 32
	DHA'RWA'R. *Mr. C. P. B. Wiltshire, Assistant Collector.*										
54	Hubli (Keshavápur) ...	Jowári mixed with	12	470	3	729	2,845 kadbi, 132½ jowár bran.	22 0 1	2 15 0 R. S.	10·89	0 8
		green gram and	12	70	1½	66	272½ gram bran.	2 13 5			
		madki 23rd December 1890.	12	50	1½	60	272½ madki bran.	2 1 9			
								26 15 3			
55	Do. do.	Do. ...	18	840	6	1,413	5,375 kadbi. 262½ jowári bran.	36 14 5	2 1 9 R. S.	5·57	0 8
		Do. ...	18	120	3	17	87½ gram bran	0 12 11			
		Do. ... 23rd December 1890.	18	90	3	2⅛	12½ madki bran	0 1 8			
	Mr. R. E. Kanga, District Deputy Collector.							37 13 0			
56	Navalgund (Navalgund) ...	Jowári with	16	930	3½	1,020	1,560 kadbi, 164 bhusa, 44 mug chaff.	28 2 8	1 5 0 R. S.	4·60	0 10
		green gram, 29th March 1891.	1	20	6½	12		0 5 8			
								28 8 4			
57	Do. do. ...	Jowári, 27th March 1891.	8	260	2⅛	321	670 kadbi. 48 bhusa. 48 chaff.	9 14 10	1 5 0 R. S.	11·87	0 20
		Linseed 16th April 1891.	4	35	19⅜	22⅔		1 2 0			
								10 0 10			

Southern Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	Prices of Produce per Rupee. By-product.	Remarks.
13	14	15	16
	Lbs.	Cwt.	
63	44 in husk.	3¾ Straw.	*Experiment No. 51* :—Unirrigated but manured rice *antarsál* on a black soil growing annually rice as kharif and lentils or gram as rabi crop. Cultivation indifferent; season good. The crop not raised from rabed or transplanted seedlings, but drilled by 6 coulter drill. Weight of straw less than weight of grain, probably not weighed. The incidence in column 11 calculated on the first or kharif crop only. Compared with Formulæ, 100 lbs. the acre the rate of seed very low.
19½ Weight Ser.	13 13/16 Gul.	...	*Experiment No. 52* :—Rásdáli Khabbu—on a mixed soil irrigated by mot from a well and a nála and assessed at garden rates. Rotation sugarcane and navani. Manured at 50 cart-loads the acre before sowing. Cultivation good and season excellent. Compared with Formulæ, yield high. By-product not weighed, but its value included in column 9. Compared with formulæ, rate of seed apparently underestimated.
119	33	...	*Experiment No. 53* :—Nigerseed on an unmanured red soil, locally called 'Mardi'. Tillage good. Sowing rain not favourable, and subsequent breaks affected the crop. Yield poor. Weight per bushel, as well as gross yield much lessened by character of season.
144 Jowári.	52 7/13	3⅜ kadbi.	*Experiment No. 54* :—Jowári mixed with green gram and madki, the two latter as subordinate row crops grown on black soil manured in June. The yield only middling and the incidence of assessment rather high. Probably a more liberal application of manure would have lowered it considerably. The season favourable for Jowári, but want of rain in September lessened the pulse yield.
151 Green gram.	41⅔	1 10/11 jowári bran.	
		1 10/11 gram bran.	
156 Madki.	51⅕	2⅜ Madkibran	
145 Jowári.	52 7/13	5½ kadbi.	*Experiment No. 55* :—Better results in this than in the last test, although the land is assessed at a lower rate; double the amount of seed was sown in this case and the result appears to have been that the jowári smothered the subordinate crops; no doubt helped by the character of the season which was unfavourable to pulses.
150 Green gram.	41⅔	1 10/11 Jowári bran.	
		1 9/10 Gram bran.	
166½ Madki.	51⅕	2⅜ Madkibran	
153 Jowari.	51 jowári.	1 11/14	*Experiment No. 56* :—Jowári and green gram on a black dry-crop soil growing in rotation 1 cotton, 2 wheat and safflower, and 3 jowári, linseed, gram or green gram. Cultivation good and season excellent for jowári. Compared with formulæ, jowári yield good, and though mug was utter failure, incidence in column 11 light. The value of manure applied 3 years ago counts for something in this test.
157⅓ Mug.	40⅜ Mug.	...	
149 Jowári.	49⅜	1 11/14	*Experiment No. 57* :—Jowári with linseed on a similar soil under same conditions as above. Compared with experiment (No. 56) jowári in this experiment was poor from want of timely rain, and incidence in column 11 consequently high, linseed failing like mug in the above.
126 Linseed.	22⅜	...	

Summary of Crop Experiment Report,

O. S.=Original Survey;

No.	District, Ta'luka, village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. G.
	KOLA'BA. *Mr. E. M. Pratt, Assistant Collector.*										
58	Alibág (Khandale)... ...	Rice (Ghorle), 1st November 1890.	16	2,000	70	2,586 In husk.	3,680	59 5 0	6 8 10 O. S.	11·04	0 10
59	Do. do.	Rice (Garve Patni), 15th November 1890.	16	2,000	60	2,499 In husk.	3,536	59 3 0	6 15 6 O. S.	11·17	0 10
	RATNA'GIRI. *Mr. E. McCallum, Assistant Collector.*										
60	Dápoli (Vánoshi)	Harik, 10th November 1890.	18	720	27⅜	503	1,704	7 1 4	0 2 10 O. S.	2·52	0 6
61	Chiplun (Pimplikhurd) ...	Náchni, 17th November 1890.	16	640	38⅕	801	2,368	30 5 6	0 5 9 O. S.	1·18	0 6
	Mr. L. N. Ajgaonkar, District Deputy Collector.										
62	Rájápur (Kudewadi) ...	Nágli (mathala), and vari 1st November 1890.	17	680	12	723 Nágli 85 Vari.	905 Straw. 150 Vari straw.	18 6 2 1 15 8 20 5 10	0 7 3 O. S.	2·22	0 8
63	Do. do.	Nágli (Khandala), 1st November 1890.	18	720	12	1,390	1,125	34 4 4	0 6 2 O. S.	1·12	0 8
64	Rájápur (Lánje)	Do. 2nd November 1890.	19	760	12	1,650	2,275	44 9 9	0 6 5 O. S.	0·89	0 8
65	Do. do.	Vari, 5th November 1890.	18	720	5½	566	1,150	13 12 0	0 7 3 O. S.	3·29	0 8
66	Do. do.	Do. 6th November 1890.	16	640	5½	505	630	11 13 2	0 3 6 O. S.	1·85	0 8
67	Do. do.	Harik, 7th November 1890.	15	580	61	545	875	7 11 4	0 5 4 O. S.	4·32	0 8
68	Do. do.	Do. ...	16	640	61	656	950	8 12 10	0 6 7 O. S.	4·67	0 8
	KA'NARA. *Mr. C. W. Hudson, Assistant Collector.*										
69	Yellápur (Sabgiri)	Sugarcane (Dasali) 28th February to 3rd March 1891.	14	4,320 Gul.	20,671 Sets.	7,614 Gul.	16,670 Tops; 34,710 Sets.	390 11 8	4 0 0 O. S.	1·02	0 4
70	Supa (Gaveghali)	Hot weather or váiuan rice 17th & 18th May 1891.	13 to 16	...	207	2,220	50 Head loads	40 15 6	2 15 0 O. S.	7·17	0 4

Southern Division, 1890-91—continued.

R. S. = Revenue Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	Prices of Produce per Rupee. By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
26	52 in husk.	$3\frac{3}{17}$	*Experiment Nos. 58 and 59* :—Good deep sweet rice land growing rice every year with a secondary pulse crop. Ample rainfall. The yield in No. 58 is better than in No. 59. Judging only from the conditions of cultivation the result should have been otherwise. In No. 59 the seed-bed was burnt with ráb of cowdung, leaves and grass, and the general area manured with fish manure. This is considered the best practice—certainly better than in No. 58 where the seed-bed only was manured with fish, and not burnt. Both crops were affected by grub. No. 59 more seriously than No. 58.
$26\frac{3}{4}$	50 in husk.	$3\frac{3}{17}$	
46	$75\frac{1}{2}$	32	*Experiment No. 60* :—Harik after nágli on upland level land which was previously four years fallow, gave without manure a fair yield. The cultivation was good and season favourable. The experimenter values the straw at a very low rate as being useless as fodder; but its value for ráb or manure might have been taken into account.
55	$33\frac{1}{13}$	$3\frac{1}{7}$	*Experiment No. 61* :—Nágli on varkas or sloping hill land gave capital return. It was the first crop taken after 5 years' fallow. The previous rotation was a slight modification of that commonly followed in the cultivation of the coarse hill millets. The season was favourable and although the tillage is not detailed it is described as good.
$38\frac{1}{4}$ Nágli.	$41\frac{1}{2}$	$8\frac{4}{7}$	*Experiment No. 62* :—Nágli muthla on an inferior stony or bharad soil growing after 5 years' fallow, 1 kulith, 2 harik and 3, nágli. This year vari was sown in rows. Manured at 40 heads the acre of dry cow and sheep dung after first showers and at sowing. Cultivation middling but season favourable.
·37 vari.	$43\frac{2}{3}$		
39	42	$8\frac{4}{7}$	*Experiment No. 63* :—Khandála Nágli on an upland level soil locally called bhátli growing after 4 years' fallow kulith and nágli. Manured at 35 head loads of dry cowdung the acre. do. do.
$36\frac{1}{4}$	39	$8\frac{4}{7}$	*Experiment No. 64*— Do. First crop after 5 years' fallow. Rabed with leaves in April. do. do.
$35\frac{1}{4}$	$43\frac{2}{3}$	$12\frac{1}{2}$	*Experiment No. 65* :—Unrabed vari on a stony red or bharad soil growing after 4 years' fallow, 1 nágli 2 sarvat rice and (3) vari. Cultivation good and season favourable.
$36\frac{1}{8}$	$44\frac{1}{2}$	$12\frac{1}{2}$	*Experiment No. 66* :—Do. on an upland level bhátli soil growing after 3 years' fallow, 1 nágli, 2 harik, and 3 vari. Cultivation indifferent. Compared with the experiment above yield low, due to bad cultivation, but the incidence in column 11 light.
$31\frac{1}{4}$	77	$12\frac{1}{2}$	*Experiment No. 67* :—Soil stony upland usually left fallow for 10 years. Rotation 1 kulith, 2 nágli and 3 harik. Harik unrabed this year. Cultivation good, but the crop sufferred from insufficient late rains, purva rains being scant.
$32\frac{2}{3}$	80	$12\frac{1}{2}$	*Experiment No. 68* :—Soil rich upland level bhátli, cultivated after 5 years' fallow and growing nágli last year. Do. do. do.
...	21 Gul.	500 Sets.	*Experiment No. 69* :—Sugarcane on rice land with unusually efficient means of irrigation, *viz.*, an adjacent never failing stream. Cultivation good, season average. Gross value of yield shows better returns than that represented by local estimation—14 annas. Ash of crushed cane and burnt leaves applied as manure with a subsequent heavy dressing of cow-dung. Tops not valued and some corrections made in experimenter's figures. 20,670 sets (value Rs. 41-5-6) not accounted for in column 9 being required for seed next season, and consequently not sold by the owner.
$85\frac{5}{7}$	$63\frac{3}{7}$	...	*Experiment No. 70* :—Hot weather or váingan rice grown on a rich soil growing kharif and hot weather rice, irrigated from a nála and liberally manured. Cultivation good and season favourable. Yield good and incidence in column 11 though on a second crop, light.

APPENDIX.

Note on sugarcane cultivation at Mundhwa, Táluka Haveli.

The most suitable soil is a deep dark loam locally called *Madhyam Káli*, overlying a light coloured clay. The plastic and retentive character of this subsoil is modified by a considerable admixture of pebbles. For such land a rent of Rs. 25 to 40 per acre is charged by the superior holder, while the Government assessment averages about Rs. 2 per acre. The Khadakvásla canal affords ample facilities for irrigation. Irregular irrigation spoils the quality of the crop by causing splitting and hollowness in the cane. The land is first flooded as the "sets" are being planted and thereafter two or three times at short intervals to encourage the "eyes" to shoot; subsequently 8 to 10 days may elapse between waterings, but the soil must be kept continuously moist. Even in the rains irrigation is required. The rainfall at Mundhwa averages 31 inches.

Sugarcane is a 12 months crop, and during the period of growth water will be laid on about 48 times. One man at Rs. 8 per month can irrigate four acres during the year. Thus the cost per acre is Rs. 24, which, with the special water-rate of 50 rupees an acre, makes the total cost of irrigating an acre of cane 74 rupees.

Cane would be grown continuously if it were found practicable. Ratoon cane is found to pay only as far as the 2nd, sometimes the 3rd year. The more common rotations are: 1st cane, 2nd ratoon, 3rd jowári (fodder); or 1st cane, 2nd ratoon, 3rd ratoon, 4th jowári (fodder).

One practical objection to continuing ratoon beyond the above period is this. The roots or "stools" become over-grown so much that the water-courses are obstructed, and there is a difficulty in irrigating equally or sufficiently. There is another objection, the old stumps do not shoot up new cane nearly so quickly as "sets" do and especially so when the weather is cold.

The cane commonly grown is *Pundya*, a tall white, soft variety liable to considerable damage on account of its softness from the attacks of jackals and pigs. As already noted, it is a 12 months crop usually planted in February and March. Nothing definite can be stated as to the exact age at which cane will yield the greatest percentage of gul. It is admitted that if allowed to stand more than a year, the percentage of sugar is increased and this is peculiarly the case with ratoon, which, although the previous crop may have been cut early in February, does not begin to grow until the hot weather. The cultivator is influenced in fixing the time of harvest by the appearance of the cane. If the upper green leaves have completely unfurled and attained their full length and there be no further indication of young leaves growing from the bud axis, then the crop is ripe and can be harvested.

In the statements appended hereto, in addition to actual cultivation charges, I make a very liberal allowance to cover cost of maintenance of machinery and interest on invested capital. The profits shown are not large. This is due to the low price of gul at the time of the experiment. The market has, however, since recovered, and Rs. 19 for 240 lbs. may be taken as the average price for the season.

The enormously high rent charges at Mundhwa preclude the possibility of fodder jowári being by itself a paying crop. It is grown because one year must elapse between the removal of old ratoon and replanting with cane. Sometimes, when the land is weedy, the cultivator prefers to sow *san* (Crotalaria juncia) instead: 72 lbs. seed per acre sown broadcast in June—July produces a crop, which in the course of two months attains a height of $2\frac{1}{2}$ to 3 feet, which is then ploughed in as green manure. This crop also smothers surface weeds.

The question of manures is an important one; sometimes the required quantity costs as much as Rs. 300 per acre. A dressing of mhowra refuse from the distillery yields an equally good crop with poudrette, but the quality of gul is inferior.

Poudrette, farm-yard manure, town sweepings and castor cake-from Gujarát are extensively used. Cake is not used alone, but as a second dressing, half the usual quantity of poudrette being applied in January before the sets are planted and 6,000 lbs. per acre of castor-cake, costing Rs. 75 at Poona applied in June—July.

Eighty to 100 cart-loads of poudrette, farm-yard manure or distillery refuse is no uncommon dressing. These quantities are valued at Rs. 250 to Rs. 300 per acre and extravagant though the expenditure appears, it has been found to pay well.

In my experiment I found that an acre of good cane when ripe weighed approximately 45 tons. The gul per acre from this crop weighed 10,180 lbs. Tops of cane weighing about 4½ tons per acre are fed as fodder.

The land is deeply ploughed in November with a large eight-bullock plough, an acre being covered in about 4½ days. The soil is turned up in huge clods and is allowed to weather before it is cross ploughed. One or two subsequent ploughings during December improve the tilth considerably, most of the clods crumble into small pieces, while the soil becomes friable and easily moved to a depth of 8 or 10 inches. The surface is now levelled with a log harrow and manure applied. Poudrette or dung or distillery refuse is deposited in heaps regularly over the field—three or four heaps from one cart-load. These are evenly and carefully spread. The land is now ridged up with a plough. The ridges are 24″ to 28″ apart. The field is finally laid out in beds 10 feet square. This is done with the *kudali* or handhoe by cutting water-courses across the line of ridges. The field is now in a condition to be planted. This operation proceeds very methodically. The cane of a standing crop is stripped, topped and cut into "sets." These sets vary in length. Each set must have three nodes or eyes, so that the sets cut from the top end of the cane are longer than those cut from the base. One acre of good cane will furnish sets sufficient to plant 12 acres. The sets are carried in head loads to the fields to be planted and laid along the ridges. Water is turned into each bed in turn. The planter begins to lay the sets carefully in the bottom of the furrows tramping each set down into the mud with his foot as he proceeds. The distance between sets is about four inches.

I may here notice that sometimes all the manure is carried in headloads and applied directly to the furrows after the beds are formed and before the sets are planted.

Planting should be done, if possible, in February and finished by the middle of March. A month after planting, the land is carefully weeded with a hand-spade and the operation repeated as often as is necessary, until the cane shades the soil. Usually four weedings are required. In June—July new beds are formed. The soil is dug and levelled and all weeds removed. A second dressing of manure may be applied at this time. The cane originally planted in the furrows is now earthed up with a handhoe, so that new water-courses are formed; no further attention is required except careful irrigation until the crop is ripe. The harvesting of the crop and manufacture of gul is done by contract. Professional sugar-boilers undertake to do the whole work. They are paid at the rate of Rs. 15 for 2,400 lbs. of jagri made. They are provided with all necessary machinery and plant, also fuel and lubricating oil. They are allowed the cane tops as fodder for the bullocks which they provide to work the cane mills. The crushed cane and withered leaves stripped from the cane are found to furnish sufficient fuel.

The following results were obtained from a carefully measured 4 guntha patch of good cane cut and converted into gul according to the ordinary process :—

Number of canes	... 2,860
Weight of canes	... 7,798 lbs.
Weight of tops	... 1,047 lbs.
Weight of expressed juice	... 5,540 lbs.
Percentage of juice to cane	... 71 per cent.

Weight of gul	... 1,018 lbs.
Percentage of gul to juice	... 18·37
Percentage of gul to cane	... 13·05
Total value of gul *per acre* at present market value Rs. ...	678

The appended statements as to cost and methods of cultivating new and ratoon cane and jowári are sufficiently explanatory without any further narrative.

Statements showing cost of production and value of produce.

I.—New Cane after Jowári.

	Per acre. Rs.	a.	p.
First ploughing in November (4 team plough does an acre in 4½ days)	11	0	0
2nd and 3rd ploughings in December; cost of 2 ploughings...	16	0	0
Levelling with harrow and crushing clods	2	0	0
Manure 80 cart-loads poudrette ... ... Rs. 160			
Cartage and spreading ... ... „ 80			
	240	0	0
Ridging of land	3	0	0
Making water-channels and beds (10 feet square) ...	2	0	0
Value of "sets" (1 acre of good cane will yield sets for 12 acres)	50	0	0
Cost of cutting cane and planting sets	10	0	0
Watering (48 waterings in a year, one man can sufficiently irrigate four acres and is paid Rs. 8 per month) ...	24	0	0
Weeding (4 weedings in a year, 1st a month after ploughing, last in May—June)	18	0	0
Digging and making new beds in July	10	0	0
Water-rate	50	0	0
Rent	25	12	0
Assessment	2	2	0
Cost of harvesting and making gul	63	0	0
Wear and tear of machinery	11	0	0
Interest on invested capital at 7 per cent.	37	9	0
Total ...	575	7	0
Value of crop (10,180 lbs. gul per acre)	678	0	0
Add—Value of ashes to be returned as manure... ...	15	0	0
Total ...	693	0	0
Profit per acre ...	117	9	0

II.—Ratoon Cane.

Clearing of rubbish of previous crop	5	0	0
Weeding four times (1st in February, last in June) ...	25	0	0
Digging and levelling in June	8	0	0
Manure ... ... Rs. 160			
Manuring (June) and cartage (Manure carried in headloads)... ... ... „ 80			
	240	0	0
Extra cost of applying manure	10	0	0
Making new beds and ridging up	10	0	0
Watering, including water-rate	74	0	0
Rent and assessment	27	0	0
Harvesting and making gul	47	0	0
Wear and tear of machinery	11	0	0
Interest on invested Capital at 7 per cent.	32	0	0
Total cost per acre ...	489	0	0
Value of produce (7,600 lbs. gul at Rs. 16 per 240 lbs.) ...	507	0	0
Add—Value of ashes to be returned as manure	15	0	0
Total Value of crop per acre ...	522	0	0
Profit per acre ...	33	0	0

III.—Fodder Jowári after Ratoon.

	Rs.	a.	p.
Digging cane stumps (Poor people are allowed to carry away stumps for fuel)	5	0	0
Ploughed once in March...	12	0	0
Four harrowings at intervals of 8 to 10 days (April—May) .	4	0	0
Drilling and harrowing (June—July)	2	8	0
Cost of seeds 48 sers (rows 10″ apart)	6	0	0
Hoeing in August	1	0	0
Harvesting and tying up in bundles in October... ...	7	0	0
Rent and assessment	27	0	0
Interest on invested Capital	4	8	0
Total cost per acre ...	69	0	0
Value of estimated average produce (900 bundles at Rs. 6 per 100)	54	0	0
Loss per acre	15	0	0

Boiling process.

The making of jágri is in the hands of professional boilers, who are very reserved as to the secrets of their craft. At Mundhwa the pans used are made of iron, and are of the wide and shallow pattern. The most usual dimensions are diameter 6½ feet, depth about 7 inches. The evaporating pan fits neatly in to the top of a mud oven or furnace, and, as far as I can judge, the whole secret of making good jágri depends upon maintaining an equal and proper degree of heat throughout the evaporating process. Each day before the first boiling the pan has to be thoroughly cleaned and coated with oil or grease. This is to prevent burning. It need only be repeated when the work has been stopped for some hours and the remnant of a previous boiling has been allowed to harden and adhere to the pan.

The amount of juice required for one "charge" weighs about 736 lbs. I found that the time occupied in boiling this quantity down to the desired consistency was nearly constant and averages two hours and twenty-three minutes. At no time is the juice allowed to boil very vigorously. Skimming is done with a wicker ladle, which is also used to agitate the syrup when the fire is too hasty. As the mass thickens it changes to a yellow brown colour. It now heaves rather than bubbles and has to be kept in continual motion with a wooden hoe. At this time repeated trials are made to test whether the syrup has approached the granular state. This is done by dropping a little into cold water and noting if it quickly hardens. If it does so evaporation is complete. The pan is now removed from the furnace and the contents emptied into another pan. As the jágri hardens it is placed in a coarse cloth which lines a cylindrical hole in the ground and there is allowed to "set" into a "sugar-loaf" weighing about 140 lbs., which is removed next day.

Expressing juice from cane.

In testing the capabilities of Subráo's 3-roller mill (The Poona-made mill in ordinary use and most forward at Mundhwa) I found that it took 42 minutes to express 72·61 per cent. of juice from 504 lbs. of cane. These are unusually good results and obtained at a time when those working wished to show the full capacity of the mill; working in the ordinary manner and allowing for all stoppages and basing my calculations on the work actually done in ten hours, I found that cane was crushed at the rate of 458 lbs. each hour and the percentage of juice to cane was 71.

J. W. MOLLISON,
Superintendent of Farms.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1891-92.

[Price—6 Annas.]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1891-92.

1334—a

CONTENTS.

	Pages.
I.—Forwarding letter	... 1— 2
II.—Analysis—	
Northern Division	... 3— 8
Central Division	... 9—16
Southern Division	... 17—24
III.—Tabular Summaries—	
Northern Division	... 26—31
Central Division	... 32—37
Southern Division	... 38—41
IV.—Appendix—	
Details of cost of cultivation of sugarcane crop on the Kirkee Farm	... 42

No. 3785 of 1892.

FROM

E. L. CAPPEL, ESQUIRE, I.C.S.,
Director, Land Records and Agriculture;

To

T. D. MACKENZIE, ESQUIRE, I.C.S.,
Chief Secretary to Government,
Revenue Department, Bombay.

Poona, 31st December 1892.

SIR,

I have the honour to submit, through the Commissioners of Divisions, the Analysis of the Crop Experiments conducted during the year 1891-92.

2. In all, 83 experiments were made during the year against 78 conducted last year:—

Division.	1890-91.	1891-92.			Increase (+) or Decrease (—).
		Reported.	Rejected.	Total.	
Northern Division	32	27	3	30	—2
Central Division	24	24	5	29	+5
Southern Division	22	21	3	24	+2
Total ...	78	72	11	83	+5

The total number of experiments, though larger than that in any of the previous five years, is still below the required standard, particularly in the Central and Southern Divisions. This was mainly due, in the year under report, to the exceptionally unfavourable season in the South Deccan and Karnátak. Here experimenters, where their time was not fully taken up by the threatening scarcity, had some difficulty in finding crops suitable for test. In Ahmadnagar, where the failure of crops was not very pronounced, the crops selected produced in only one instance an outturn exceeding half average.

3. The number rejected is large, but it is satisfactory to note that standing orders on the subject are generally better understood and more closely adhered to than heretofore. Only one officer, Mr. Vádekar (Ahmadnagar), has attempted a special test.

4. A few attempts have been made to estimate cost of cultivation, but the results are mostly so meagrely reported that only two are noted in the analysis. It has on previous occasions been brought to the notice of experimenters that, unless they find leisure to deal fully with the question, details of cost of cultivation in ordinary experiments are not useful. Full details of the cost of cultivation are, of course, essential in special experiments.

5. The programme, which was on the same general lines as that of the previous year, was not fully adhered to. This was due in part, as stated above, to seasonal causes. The marginal table shows the number of experiments carried out on the various staples in each division. Rice tests are the most numerous and give important results. Rice experiments in Belgaum show considerable differences of outturn as compared with the formulæ, and further trials are required to place results beyond doubt. Next in importance come the oilseeds with 18 tests. The Ahmadnagar experiments were all on mixed crops, *kardai* being the subordinate crop in each case. An extraordinary outturn of wheat reported from Akola seems to need verification by further test. The experiments on hill grains, *nágli* and *harik*, go to supplement the useful information recorded in last year's report. The sugarcane experiments in Poona are interesting as showing the high cultivation carried on at great centres.

Crop.	Northern Division.	Central Division.	Southern Division.	Total.
Rice	12	...	8	20
Oilseeds	3	15	...	18
Wheat	3	3	3	9
Mixed crops	...	6	1	7
Nágli or bávto	2	...	5	7
Sugarcane	...	3	2	5
Pulses	4	...	1	5
Harik or Kodra	2	...	2	4
Cotton	2	...	...	2
Navani or rála	...	...	2	2
Maize and juvár, 1 each ...	2	...	...	2
Patato and coriander, 1 each ...	...	2	...	2
Total ...	30	29	24	83

6. There are several instances this year, as last, in which the anna estimates are apparently wide of the mark, and the attention of experimenters should be directed to this point, which is of special importance as a check on the *formulæ* which have been shown to require thorough revision. Special reference was made to this matter in paragraph 4 of Mr. Ozanne's letter forwarding the Crop Experiment Report for 1885-86.

7. Under Government Resolution No. 8139, dated 13th October 1892, crop experiments are henceforward to be carried out on an extended scale to meet the requirements of the new quinquennial outturn returns. Each Assistant and Deputy Collector will make 3 (instead of 2) *ordinary* experiments or in lieu thereof one *special* experiment. Superintendents of Farms and Divisional Inspectors are to conduct experiments under the same ruling. The programme for the current season has been arranged in consultation with Collectors, attention for the present being now, for the special purpose noted, directed mainly to the staple crops of each district.

8. I have pleasure in bringing to notice the names of the undermentioned officers who have forwarded good and careful reports :—

Northern Division...	Messrs. Batchelor, Phirozsháh and Baig.
Central Division	Messrs. Vádekar, Morison, Mollison, and Fawcett.
Southern Division	Messrs. DuBoulay, Orr and Ajgáonkar.

Mr. Cooke, Collector of Kaira, made eight valuable and well reported experiments in lieu of his Assistants who were unavoidably prevented from experimenting.

9. The reports have been carefully scrutinized by Mr. Mollison, whose criticism has been of great value to me in their review.

I have the honour to be,
Sir,
Your most obedient servant,
E. L. CAPPEL,
Director, Land Records and Agriculture,
Bombay.

ANALYSIS OF CROP EXPERIMENTS.

NORTHERN DIVISION.

Ahmadabad.

Six experiments have been reported from this district:—

Mr. G. S. Curtis	...	...	... 1 on wheat.
Mr. J. K. N. Kábráji...		...	... 1 „ cotton.
Mr. B. E. Modi	...	...	... 4 „ rice.

Mr. Curtis failed to make rice experiments as arranged, owing to the interference of other duties. Mr. Kábráji proceeded on leave before he could complete his test on cotton.

Mr. G. S. Curtis, Assistant Collector.

Submits one test on irrigated soft-red wheat. The report is meagre, giving little beyond the tabulated figures. The field selected grows two crops every year, and, inclusive of water-rate, is assessed at Rs. 5-12-2 per acre. The crop is described as short in straw and ear and is estimated at 11 annas. But the outturn (2,051 lbs. grain) indicates that it was a bumper crop. The straw and chaff were not weighed. The gross acre value comes to Rs. 76-4-0. After the rain crop (*juvár*) was harvested, 20 loads cowdung were applied per acre. The season was very dry, but this would have little effect upon an irrigated crop. It was probably advantageous in a district so subject to rust as the Ahmadabad Collectorate. The seed was broadcasted in November and the crop was ripe in March. The seed-rate is high, 164 lbs. per acre, but an irrigated crop takes more seed than a dry crop.

Mr. J. K. N. Kábráji, Assistant Collector.

Commenced a test on cotton (*vágadia*) but took leave before finishing it. The experimenter was present at the first picking. The second was left to the Mámlatdár. This variety is gathered in the pod; the crop yielded 182 lbs. per acre of lint and seed and 75 lbs. of shells, &c. This would represent about 60 lbs. of clean cotton per acre, a very poor return from good soil in a favourable season. I doubt whether the figures are trustworthy, and no details of cultivation are given. The crop was picked so late as the 6th and 31st March, without any explanation of this circumstance. Under the circumstances I am compelled to exclude this experiment as untrustworthy.

Mr. Bamanji Edalji Modi, District Deputy Collector.

Sends four carefully conducted tests, all on rice. Of these, two (Nos. 4 and 5) are on land recently reclaimed from waste under command of an adjacent tank. The soil of these fields is a stiff loam (*besar*), and, inclusive of water-rate the numbers are assessed at Rs. 5-4-6 and Rs. 5-13-10 per acre. *Kamod*, a fine variety of rice requiring plenty of water, was grown on one field (No. 4), and, owing to scant rainfall in the latter part of the season, gave a rather poor yield (951 lbs. grain per acre). The monsoon rain was late and rice seedlings were, not transplanted until the end of September. 40 lbs. of seed gave seedlings sufficient for 2 acres. *Sutarsál* rice on the second field (No. 5), grown under precisely similar conditions, gave an outturn of 1,561 lbs. grain per acre. Compared with *kamod* rice, this variety requires less water and is worth 4 to 8 annas less per 40 lbs. Each field was fairly manured and the cultivation is described as good.

Two other tests (Nos. 2 and 3) of *sutarsál* rice were made by this experimenter. One on light soil (*gorádu*), the other on *besar* land. Each crop was grown from seedlings transplanted late in the season. Late rains held off, and both fields were irrigated, the light land four times, the heavier soil three. These fields grow rice every year. The *besar* land carries occasionally a second crop (barley). Neither field was manured this year. An outturn of 1,526 lbs. per

acre from the *besar* and 1,042 lbs. per acre from the light land are estimated as 15 and 14-anna crops. The incidence of assessment on the latter field is rather high, 21·42 per cent. The anna estimates may be fair for an unfavourable season such as this, but would not apply to an average one.

Kaira.

The eight experiments received from this district were all conducted by the Collector. Neither Mr. Lawrence, the Assistant, nor Mr. Motilál, the District Deputy Collector, experimented. The Collector writes: "I am quite satisfied that it was impossible both for my Assistant and Deputy to conduct any crop experiments this year, the former owing to his having to attend the usual examination and inexperience, and the latter owing to his having to try some very heavy border affray cases which tied his camp down to one place and to his annual examination of the *Jamábandi* returns."

Mr. H. R. Cooke, Collector.

Sends in all eight tests. The four rice experiments were taken on crops selected with the object of gaining special information. Mr. Cooke fully describes the object of each test. The two *bávto* and two *kodra* tests were undertaken, because the Deputy Collector was unable to experiment and the crops tested were admittedly in three instances under the average of similar crops in the same localities. The Collector explains that these crops (*bávto* and *kodra*) varied considerably within a limited radius owing to heavy local showers in June and July. For the rice experiments the Collector endeavoured to select crops :—

(*a*) to represent a full average in an ordinary year,

(*b*) to represent 8-anna or half crops.

The full average crops were of *jini* and *kamod* rice, both good and representative plots. The field under *jini* (No. 11) was irrigated twice from the Khári river and once from a well, and inclusive of water-rate, is assessed at Rs. 10-5-0 per acre. That under *kamod* (No. 13) is assessed, inclusive of water-rate, at Rs. 8-12-10 per acre, and was irrigated three times from the Khári river and from a tank. The first field has *besar kiári* soil and was manured with fifteen cart-loads ordinary manure. The second field is *besar* and to this only 5½ loads per acre were applied. The first field carries occasionally a second crop (barley or wheat). The second field carries a second crop of wheat every year. The *jini* rice had a seed-rate of 18 lbs. per acre, sown in July, seedlings being transplanted in September. The crop was harvested on the 22nd of November and produced 2,774 lbs. of grain per acre, giving with the straw a gross value of Rs. 83-10-7. The *kamod* with a seed-rate of 14 lbs. per acre, sown in July and seedlings transplanted in August, gave an outturn of 2,694 lbs. of grain. The crop was harvested on the 24th of November. The gross value per acre of this crop was Rs. 94-9-8, *kamod* being a fine variety commanding a high price. The outturn figures have been corrected in my office. The weighments were made at the time of harvest and tests of samples preserved showed that dryage amounted to 10 to 12 per cent. The experimenter explains that it is impossible to ascertain the proportional area of seed-bed to area of transplantation, the seed-beds being formed near the villages at a distance from the fields and their boundaries being afterwards irrecoverable.

A crop of *jini* rice (No. 10) estimated at 8 annas, irrigated three times, was raised from seedlings transplanted in August in *besar kiári* land. The field is assessed, inclusive of water-rate, at Rs. 8-3-9 per acre. The outturn was 1,427 lbs. of grain per acre. *Sutarsál* rice (No. 12) estimated at 7 annas, and grown on land assessed at Rs. 6-3-2, gave 1,562 lbs. grain per acre. In this case the seed-rate appears to be under-estimated at 8⅕th lbs. per acre.

The Collector has devoted so much painstaking labour to all his experiments that I regret my inability to accept his *bávto* and *kodra* tests (Nos. 6—9) except under caution. They are, however, recorded for what they are worth. The grain was weighed before it was dry. Samples retained were kept in corked bottles, so that they failed to show a normal decrease by dryage. The Collector says that the cultivator keeps his grain as secure from dryage as possible, but

ordinary exposure must take place. *Kodra* and *bávto*, the Collector remarks, are rarely grown alone. The subordinate mixture was literally a sprinkling a plant here and there of túr, jowár, math, mug and cotton. The subordinate mixtures are, however, often more pronounced than this in the Kaira district. *Kodra* is recognized as an exhaustive crop in Gujarát and is rarely taken on the same land in consecutive years, unless there is a considerable admixture of *túr*, usually drilled in separate rows, this deep-rooted pulse, which takes 8 or more months to mature, having a well defined fertilizing influence on the soil.

Panch Mahals.

Mr. E. Maconochie was unable to carry out the programme owing to the exigencies of his tour. The Collector accepts his explanation as satisfactory. Three experiments in all are reported, one by Mr. Maconochie on rice, and two on maize and gram by Mr. Pránlál Harkisandás, District Deputy Collector

Mr. E. Maconochie, Assistant Collector.

Furnishes only one test (No. 14) on *vánkla* rice, an inferior variety. The crop was grown on *kiári* land assessed at Re. 0-14-6 per acre. The rainfall came late and ended early and was not supplemented by irrigation. The seed 20½ lbs. per acre was broadcasted, presumably in July, although no date is given. Seedlings failed and the field was re-sown at a similar rate. The field was fairly manured but carelessly cultivated. The soil, mixed black, carries rice every year. The outturn estimated at 8 annas amounts to 810 lbs. grain (against 640 of the formulæ) and 700 lbs. of straw per acre. The straw was short and grain did not fill well. This may be attributed to a short rainfall coupled with neglect of weeding. The percentage incidence of assessment on outturn is low.

Mr. Pránlál Harkisandás, District Deputy Collector.

This officer's double test (Nos. 15 and 16) taken on rain and rabi crops grown on the same field, goes to show what the burden of assessment is on land carrying two crops in one year. The second crop occupied precisely the same area as the first. The report is very meagre. The field was light brown *gorádu* soil, assessed at Re. 1-14-0 per acre. The kharif crop was maize, drilled on the 29th June and ripe on the 15th October. The field was unmanured, and with a favourable season the cultivator may well be satisfied with an outturn of 1,436 lbs. grain and 1,332 lbs. of fodder per acre, the gross value of which comes to Rs. 32-10-0. The experimenter estimates this as a 12-anna crop, but it would denote 18 annas according to the formulæ. The general average of the táluka, however, was 12 annas.

Red gram with a subordinate mixture of barley and rape was drilled on the 7th November and harvested on the 8th March, when apparently all the crops were ripe. The seed-rate was 64 lbs. gram, 19⅕ lbs. barley and 1 lb. 11 tolas rape per acre. The experimenter's figures indicate that there were three rows of gram alternating with one mixed row of barley and rape; but this is not quite clear. The crop was unmanured. The experimenter states that the moisture in the soil was insufficient for the mixed crop, leading to a poor outturn. I doubt whether this remark is accurate. Gram can do with a minimum quantity of moisture, and barley and rape without sufficient moisture would have matured or withered in less than four months, the period which elapsed between sowing and harvest. Considering that the land was unmanured the outturn of grain, 443 lbs. gram, 111 lbs. barley and 11 lbs. of oilseed, was favourable. Taking the value of rain and rabi crops together, the percentage incidence of assessment works out 4·04 and this would have been lowered if the field had had liberal management.

Broach.

According to the programme the Collector requested each of his Assistants to conduct a special test in addition to the ordinary tests, if possible. This Mr. Batchelor and Mr. Phirozsháh Pestanji both failed to carry out owing to difficulties which apparently might have been overcome; but each officer forwards three ordinary experiments.

Mr. S. L. Batchelor, Assistant Collector.

Three ordinary tests carefully conducted and well reported. The first experiment (No. 17) is on wheat grown on black cotton soil assessed at Rs. 3-12-7 per acre, carrying cotton and wheat in alternate years. The crop was selected as representative of similar crops in the Broach, A'mod and Jambusar tálukas, where this year wheat and *láng* approached the bumper standard of outturn. The wheat is described as "Potya", but the sample received shows it to be a hard yellow variety. No manure was applied. The cultivation is described as good, the field being carefully ploughed, free from weeds and giving evidence of careful husbandry. The seed, 40 lbs. per acre, was drilled with a two-coulter drill in November and produced a crop, ripe in February, which yielded 492 lbs. grain and 810 lbs. straw. This is probably over-estimated at 18 annas. Good deep black soil under favourable conditions should give a much better outturn.

Láng (No. 18) in higher assessed black soil yielded excellently, and if, as the experimenter thinks, the crop represented the general outturn of three important tálukas, then the harvest throughout was unusually good. This particular field lies low and usually remains moist during the year. Sometimes with a heavy rainfall it gets too wet and on this account the cultivator is prevented from taking cotton every year. The general luxuriance of the *láng* crop is attributed to plentiful rains coupled with absence of cloudy weather in the latter part of the season. The field was ploughed six times during breaks in the monsoon and the seed 40 lbs. per acre was drilled in October. No manure was applied. The crop was ripe in February and yielded per acre 925 lbs. pulse and 1,323 lbs. fodder, and is estimated at 19 annas.

Juvár (No. 19) on deep black soil, unmanured but ploughed four times, did not give the outturn which the bumper estimate should imply; 792 lbs. grain per acre cannot class a *juvár* crop on such land above 12 annas or thereabouts. The experimenter has apparently undervalued the 364 bundles of *kadbi* per acre, which probably weighed more than 2 lbs. each as estimated.

The incidence of assessment in each of Mr. Batchelor's tests is high and the explanation may be found in the fact that the crops experimented upon are distinctly subsidiary to cotton, the rent-paying crop of Broach and Surat.

Mr. Phirozsháh Pestanji, District Deputy Collector.

A new experimenter; submits three ordinary tests on (1) láng, (2) wheat, and (3) cotton. The reports are carefully drawn up and give full information on all points of interest.

This officer's *láng* test (No. 20) may be contrasted with Mr. Batchelor's (No 18). The crop was grown on good black soil assessed at Rs. 4-13-4 per acre. The seed-rate was 41 lbs. per acre. Seed was drilled in October and crop was ripe third week in February. The outturn, 1,055 lbs. pulse and 1,520 lbs. fodder per acre, is considerably under-estimated at 12 annas. Cotton rotates with *láng* or wheat in this field and, under ordinary circumstances, would have been the crop this year, but a heavy rainfall of 60 inches (average 25) swamped the cotton seedlings and *láng* was taken as a rabi crop. Doubtless the heavy rainfall favoured the *láng* which delights in a deep damp soil; but in one part of the field it appears to have been too much even for this crop. The part of the field under *láng* is cultivated by the registered occupant. The rest was this year cropped by a tenant who pays Rs. 12 per acre which proves that in this case the assessment is light.

For rabi crops the season was most favourable. With a seed-rate of 61½ lbs. per acre drilled in October the wheat crop (No. 21) was ripe at the end of February and produced 849 lbs. of grain and 1,130 lbs. of straw per acre. This yield is also estimated at 12 annas, probably an under-estimate. The tenant by whom this wheat crop was grown manures his land every third year, though the occupant uses no manure. This is of course attributable to the Rs. 12 rent paid, which compels high farming.

This officer's third test (No. 22) on cotton is open to question, as he himself supervised two pickings but left the third to táluka officers. The experimenter states that he closely examined the crop when the second picking was completed and saw then very few immature bolls, and on this account deducts

17 lbs. from the recorded weight of the third picking or 87 lbs. seed cotton per acre. I should say that the crop was over-ripe when the first picking was undertaken; 338 lbs. per acre is abnormally high for one picking. Only a week elapsed between the first and second pickings. The third was made on April 8th, three weeks after the second. Altogether the produce, estimated at 14 annas, comes to 502 lbs. per acre of lint and seed, worth Rs. 29-1-1. The land is moderately good black and is assessed at Rs. 2-9-5 per acre. The heavy rainfall destroyed the first sowing, but seed was again sown in August and the season afterwards was very favourable. The seed-rate is stated at $7\frac{1}{4}$ lbs. The seed was drilled with a two-coultered drill through the seed bowl and seed tubes, a practice unknown except in Broach.

Surat.

The programme has not been carried out in this district, only three tests in castor having been forwarded. Messrs. Weir and Syad Nuruddin Khán conducted no experiments, the reason being unexplained. Mr. Dárásha carried out only 1 test, being detained at head-quarters by heavy criminal work.

Mr. Ánna Gopál Kotvál, District Deputy Collector.

This officer's two castor-oil tests would have been of more value if full and accurate details had been given. The report is sketchy and the figures of the first test are apparently inaccurate. Each crop was a second crop after rice.

The first test (No. 23) was taken on black soil assessed at Rs. 7-12-8 per acre. The field was liberally manured for rice. The castor-seed 45 lbs. per acre (a high seed-rate) produced a crop estimated at 12 annas, ripe early in March. This produced 155 lbs. purified oil and 303 lbs. *khol* or oil-cake per acre. The ratio between the two products is questionable, as a larger proportion of oil should have been obtained. The waste is not recorded, and the weight of oilseed per acre had to be called for by a special reference. The results as finally ascertained are noted below. The *khol* used as manure is said to have been worth 85 lbs. per rupee at date of experiment, an unusual and suspiciously high rate.

The second test (No. 24) is probably more trustworthy. The crop was sown about the same time and in the same manner but with a lower seed-rate, 33 lbs. per acre. The soil, also black, is assessed at Rs. 3-4-4 per acre. This field also was liberally manured for rice. The produce from this crop, treated in precisely the same way, gave 201 lbs. purified oil and 287 lbs. *khol* per acre. This result gives almost identically the same ratio of oil to oil-cake as that recorded in experiment No. 23 of last year, and that test shows a waste of 6·7 per cent. in manufacture.

The results per acre may be put with advantage in the form adopted last year :—

Experiment.	Weight of seed.	Weight of oil.	Weight of *khol*.	Value of oil.	Value of *khol*.	Total Value.	Assessment.	Percentage incidence.
	Lbs. t.	Lbs. t.	Lbs. t.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1st test	458 18	155 14	303 4	21 7 10	3 9 6	25 1 4	7 12 8	31·01
2nd do.	488 23	201 23	286 38	27 14 2	3 6 2	31 4 4	3 4 4	10·44

Compared with the figures recorded last year the following points may be noticed. The percentage of oil to seed comes to 33·89 per cent. in the 1st and 41·16 in the 2nd test against 39·04 in that of last year. The ratio of oil to *khol* is 100 : 195·1 in the first; 100 : 142·3 in the second; and 100 : 138·7 in the last year's test. The percentage of seed to *khol* is 66·11 in 1st, 58·84 in the 2nd, and 54·16 in that of last year. No wastage is shown in this year's tests.

Mr. Dárásha Dosábhái, District Deputy Collector.

Tested castor (No. 25) grown on black land assessed at Re. 1-13-8 per acre. Drilled in October the crop was ripe in the end of February and produced 427 lbs. of seed estimated as a 10-anna yield. The assessment does not seem high, particularly as the field was unmanured, a rather unusual practice with this crop. The field appears to have been under this crop for three years past. With only one crop the percentage incidence of assessment on produce works out 9·41.

Tha'na.

Messrs. Baig and Cursetji forward two tests each. Mr. Pratt was exempted by the Collector, having been entrusted with special duty in connection with the testing of the annual production of toddy trees.

Mr. Mirza Abbás Ali Baig, Assistant Collector.

Furnishes two tests, which are well and fully reported, and probably as valuable as any submitted this year. The first (No. 26) is on rice taken to show the value of good ráb in a year of deficient rainfall. The other (No. 27) is on *vál*, a second crop on the same field. The field selected has first class dark brown soil, assessed at Rs. 5-2-5 per acre, and carries rice followed by *vál* every year. This field, like many other bunded rice fields, is (excepting the seed-bed) unmanured. But the washings carried during the rains from higher levels doubtless add year by year to the depth as well as to the fertility of such land. The area of seed-bed was carefully measured and its proportion to area of transplantation ascertained; 44 lbs. of seed sown on 4 gunthas furnished seedlings sufficient for 29 gunthas. Subsequently the experimenter was able to ascertain the actual quantity of cowdung ordinarily used for ráb purposes. At the date of his second experiment Mr. Baig found the ráb material laid on the seed-bed preparatory to being burnt for the next rice crop. He found 192 lbs. dry cowdung per guntha and he estimates this as the average quantity used every year on this holding.

The seed was sown on the 27th June in the seed-bed and the crop was ripe early in November. The produce comes per acre to 988 lbs. of grain and about a ton of straw and chaff. The September-October rains practically failed, and the outturn of grain was seriously lessened.

The second crop was broadcasted at 43 lbs. per acre as soon as the rice stubble could be ploughed in. Requiring less moisture than rice the *vál* gave a fair outturn, 359 lbs. per acre.

The value of this experiment is enhanced by the attempt made to determine how far a cultivator can depend upon his own cattle for manure. A well-fed bullock was kept under supervision and was found to produce 20 lbs. of wet dung, equal to $5\frac{1}{4}$ lbs. dry matter in 24 hours. This is equivalent to 1,916 lbs. dry dung annually. Deducting half of this as produced during the day, and not available, and a sixth more used for fuel, there still remains 800 lbs. This would cover, at the rate used in the test, about 4 gunthas of seed-bed to produce seedlings sufficient for $\frac{3}{4}$ acre of transplantation; and a pair would supply a seed-bed of $1\frac{1}{2}$ acres. The cultivator of the field experimented upon had 2 bullocks and a calf. The capacity of an under-fed bullock was also tested, and this animal was found to produce at the rate of 1,156 lbs. dry cowdung per year. An average cultivator of the district cultivates about $2\frac{1}{2}$ acres of rice and generally owns a pair of bullocks, a milch cow and one or two young animals. Keeping in view the calculations noted, and making due allowance for wastage and for loss of manure while the animals are grazing or are at work, a cultivator should on these terms have sufficient for ráb purposes; and the experimenter remarks that in villages where tree loppings, brushwood and other forest produce are not procurable, he has seen cowdung saved with the utmost care in underground pits. The rayat generally, however, fails to appreciate the fact that the urine is, weight for weight, the more valuable part of the excreta for manurial purposes.

Mr. J. M. Cursetji, District Deputy Collector.

Submits two rice tests. The first crop was grown from transplanted seedlings, raised on a seed-bed rábed with cowdung, &c. The second crop was grown from sprouted seed, a risky plan, except with favourable early rain. This plan is known as the *ootta* system. The crops were grown on different portions of the same field, which is rented by a tenant, who pays the registered owner 34 maunds of rice for the right of occupancy over $4\frac{1}{4}$ acres. The experimenter has recorded the weight of the local ser of grain of each crop at more than double the weight found in my office; and the figures of seed-rates and acre yields are apparently equally untrustworthy. For this reason I am compelled to exclude these experiments which are otherwise carefully executed. Although useless for record, they show that a crop raised from rábed seedlings has a decided advantage over crops raised from sprouted seed in a year when the rain is not seasonable.

CENTRAL DIVISION.

Kha'ndesh.

Only three officers forward experiments from this district:—

Mr. K. R. Bamanji	2	on linseed.
Mr. J. C. Gloster...	1	do.
Mr. Kázi Kamruddin.	2	sesamum.
... ...	1	coriander.

Mr. Shrinivás Báláji, who was asked to conduct tests in sesamum and linseed, states that the former crop was harvested before he could start on tour, and a test in linseed, which he took, was found to be defective for reasons not explained and was not reported. This explanation is regarded by the Collector as unsatisfactory. Mr. Gloster was to have conducted a second test in coriander, but his time was too fully taken up in the examination of the *Jamábandi* papers of the Bhusával táluka, where the revision survey had recently been introduced.

Mr. K. R. Bamanji, Assistant Collector.

Sends two linseed tests (Nos. 28 and 29). The yield in the first case is a bumper, and in the second a full average. The second field has rich black soil assessed at Rs. 2-2-6 per acre, which under ordinary conditions would have produced the best crop, but the lighter land of the first experiment produced 606 lbs. of seed per acre, the heavy land 384 lbs. Linseed is a delicate crop, peculiarly susceptible to injury from seasonal causes, and the experimenter is doubtless right in attributing the difference in yield to heavy late rain not well distributed, the effect of which the crop on the medium soil was best able to withstand. The returns from both fields would more than satisfy an average cultivator in this district. The yield usually varies from 250 to 400 lbs. The seed-rate, 17 lbs. on the light land, is nearly double the usual rate. The straw of linseed is of poor feeding value and the chaff also, unless it contains light seeds.

Mr. J. C. Gloster, Assistant Collector.

Furnishes a linseed test (No. 30) on land assessed at Re. 1-4-10. Cotton and jowári are the usual rotation, an occasional rabi crop being grown as is common throughout Khándesh. The rabi crop permits of the land being fallowed and more or less cleaned during the rains, if infested with the deep-rooted *kunda*. A late crop is taken and the land is then in better condition for cotton, the rent-paying crop, in the following year than if kharif crops were grown continuously. The soil of the field, reddish brown, has a marked slope and the experimenter says that it therefore lost the full benefit of the copious late rains. But more probably this was advantageous to the crop. 15 lbs. seed per acre drilled in November gave an outturn of 570 lbs. oilseed. This is much above the average at which the crop is estimated. The crop was ripe on the 11th February. The by-products, chaff and straw are valued at rather a high rate, Rs. 2-13-0 per acre.

Mr. Kázi Kamruddin, District Deputy Collector.

Furnishes three tests, two on sesamum and one on coriander. The latter is omitted because, though the crop is reported to have been grown unmixed, the sample of seed forwarded contained about $\frac{1}{4}$ by weight of mustard, the presence of which is not satisfactorily accounted for. Besides, the incidence of assessment in this test reaches 47·98 per cent., a rate which there is nothing to explain. A suspicion of inaccuracy attaches to the sesamum tests also, which compels me to exclude them. The test areas (25 gunthas and 1 acre respectively) were unduly large, and several inaccuracies in the tabulated figures were corrected in my office. Pound samples instead of measured sers were forwarded and standing orders have not been attended to. Contrasting the two tests we find 2 lbs. seed per acre drilled on poor land assessed at Re. 0-6-4 per acre, while 1 lb. per acre sufficed for better land assessed at Re. 1-4-0. The difference in the seed-rate

is accounted for by the difference in quality of the soil. In each field *til* is said to have followed cotton, but how land assessed at Re. 0-6-4 is capable of growing cotton is not understood. The yield from each field is said to be exactly the same—153 lbs. per acre. The oilseed from the best land is valued at $12\frac{1}{6}$ lbs. per rupee, from the inferior soil at 16 lbs. per rupee. The outturn is too low in each case for a 12-anna estimate. The figures carry no conviction and I cannot accept the tests.

Na'sik.

Six experiments have been received from this district. Mr. Deshmukh could not make a second test in linseed or niger, as both these crops were very poor.

Mr. L. G. Deshmukh, Assistant Collector.

Conducted a carefully reported test (No. 31) on *kátháli* sesamum. This black variety contains a greater percentage of oil than white *til* (Havri). The latter has, however, the higher market value and is largely used in the manufacture of sweetmeats. The seed-rate, $1\frac{5}{6}$ lbs. per acre, is higher than the average rate of Khándesh. The seed being very small it is usually mixed with dry powdered cowdung and sand to secure even distribution. The crop tested was drilled in July and was ripe on the 21st October. The produce, 438 lbs. per acre, is estimated as an average crop. The land was unmanured. Cultivation and season were both good. The soil is black and the field is assessed at Re. 0-15-5 per acre. The stalks have little value except for fuel. The experimenter remarks upon the care that is exercised in handling the sheaves or bundles while drying, the seed capsules opening and the seed dropping out unless the sheaves are kept in an upright position. They are usually stooked on the threshing floor, and turned repeatedly to the sun so that they may dry as soon as possible. The seed is separated by inverting and shakin g each bundle on to the threshing floor.

Mr. H. W. Hayward, Assistant Collector.

Three experiments are submitted by this officer. Two of them on *khurásni*, (Nos. 32 and 33) are interesting as showing the returns in a favourable year from poor stony *mál* land assessed at a low rate. The revision survey assessment is in each case 6 annas per acre. The fields were unmanured and are apparently incapable of producing crops every year. The land requires periodical fallows to produce during two or more years middling crops of *nágli* and *khurásni*, which are taken in rotation. In the first experiment it is doubtful whether the seed-rate, 3 lbs. per acre, is not too low. Broadcasted in July the crop was ripe in November, and gave 279 lbs. of oilseed and 880 lbs. by-product per acre; the latter though useful as fodder and for ráb is not valued.

With a higher seed-rate, 9 lbs. per acre, sown in the end of July, the second field gave much the same results, the gross value of outturn being in one case Rs. 10-5-0 per acre, in the other Rs. 9-11-0. The incidence of assessment is moderate. It must be remembered, however, that during fallows there is little return. The crops seem to be over-estimated at 16 annas.

Linseed (No. 34), tested by the same experimenter, grown on medium black soil assessed at Rs. 2-3-1, produced 251 lbs. seed per acre. The land was well cultivated, but the season was indifferent and the crop is over-estimated at 16 annas. The percentage incidence of assessment works out rather high. The seed was broadcasted; it is usually drilled.

Mr. V. R. Patvardhan, Acting District Deputy Collector.

Submits a *khurásni* test taken on poor *mál* land assessed in revision survey at Re. 0-4-4 per acre. *Rági* and *khurásni* are alternately taken, with an interval between crops of two years. The seed is, I think, under-estimated at 2 lbs. per acre. Sown broadcast in September the crop was ripe in December, and produced 58 lbs. of oilseed per acre. Want of rain affected the crop, which is estimated at 7 annas. It was irregular and in some parts of the field very poor. Tests should, if possible, be avoided on very irregular crops. This experimenter attempts to estimate the cost of cultivation, but without sufficient care or knowledge, and Mr. Patvardhan's estimates are totally inaccurate. I do not think the experiment worth inclusion.

Mr. K. M. Thatte, District Deputy Collector.

Mr. Thatte's safflower test is omitted. His report (with slight changes due to difference of crop) appears to be merely a close copy of his predecessor Mr. Patvardhan's.

Ahmadnagar.

No experiments could be made in niger seed in Akola as proposed, little being sown this year and much of that little being destroyed by the heavy August rain. In other respects the programme was fairly followed, but the crops tested, with a single exception (wheat in Akola), were more or less poor owing to failure of late rains.

Mr. Sorábji Padamji, Assistant Collector.

Submits two experiments in the Kopargáon and Akola tálukas.

The first experiment (No. 35) was with gram, with subordinate rows of *jowári* and *kardai*. The two latter were sown mixed, one row of the mixture to five of gram. The crop, estimated at 4 annas, was practically a failure owing to deficient rainfall. The field has shallow *barad* soil, assessed at Re. 0-6-1. The *jowári* withered before it came into ear. The gram and *kardai* produced respectively 66½ lbs. and 30½ lbs. of pulse and oilseed per acre.

The returns from this experimenter's second test (No. 36) on good deep black soil, capable of holding moisture, are extremely good. The crop tested was wheat and *kardai*. The area under wheat was 6·5 times that under safflower, 30½ lbs. of wheat and 4½ lbs. safflower being sown mixed per acre. Drilled with the *moghad* (a three-coultered heavy drill) in October, the wheat was ripe in February, the safflower later. The outturn (under-estimated at 12 annas) comes to 1,956 lbs. wheat and 969 lbs. safflower per acre, the gross value being Rs. 108-6-5 per acre. The experimenter remarks that even with more favourable rain he doubts if the outturn could be much better, though more rain might have improved the quality of the wheat. The sample forwarded to my office had a bushel weight of 62½ lbs. This is by no means a bad weight for the *kátha* variety, although extra fine samples have been known to weigh up to 65 to 66 lbs. per bushel. I am somewhat suspicious of the accuracy of this test, because the season was adverse to the local rabi crops, the estimate being 6 annas only. Moreover, the outturn reported is more than seven times that of the formulæ for a 12-anna, and nearly 3¾ times that for a 20-anna or bumper crop. However, Mr. Padamji assures me that there has been no mistake and the results may be accepted with this caution.

Mr. R. B. Stewart, Assistant Collector.

Sends in two reports on mixed crops, the first being wheat with safflower, the second gram with safflower. The wheat (No. 37) yield is only 195 lbs. per acre, with oilseed 22 lbs. The 12-anna estimate of the wheat crop is too high, an error noted with this experimenter last year. Gram with safflower (No. 38) gave 475 lbs. of pulse and 7½ lbs. of oilseed. This was from a seed-rate of 32 lbs. of the former to 4 lbs. of the latter. The seed was drilled in each field in September, and the crops appear to have been ripe together on the 8th of February. This in the case of the gram and wheat is doubtful. A poor crop of wheat would certainly mature in less than six months.

Mr. V. B. Vádekar, District Deputy Collector.

Submits two special experiments on *jowári* and safflower mixed. Having taken only four gunthas for his test area the experimenter has not followed the rule which exacts a minimum area in special tests of five per cent. of the holding. The tests ought to have extended to at least half an acre in the first case and to one acre in the second. The experiments are otherwise carefully conducted. The first test deals with *barad* land with a slope which prevents the retention of rain water, so that ample and frequent showers are required to produce a good crop. The other field is flat black soil. Late rain was scanty and very unfavourable and reduced the yield in both to 11 annas. The somewhat low yield of grain in the first test is more than made up by the *kadbi*, which is double that of the

second test.

First test.—The crop tested (No. 39) covered the whole of the survey number (area 10 acres and 25 gunthas). The occupant, a *Marátha*, owns no other field, his income being supplemented by his emoluments as *pátil* of the village. He has a wife and five children to support, none of whom do any work. The field was cultivated partly by himself and partly by hired labour, which cost him Rs. 10-12-0. He owns four bullocks and borrowed six others without payment. The total yield of the holding came to—

Crop.	Principal product.	By-products.
Jowári	3,089½ lbs.	3,294 bundles *kadbi*.
Kardai	1,042 lbs.	744 lbs. chaff.

Deducting from this expenses in kind—

2,160 lbs. of *jowári* grain required as food for the family at 6 lbs. per day;
3,000 bundles of *kadbi*, cattle feed for five months at 20 bundles per day;
201 lbs. grain, 215 bundles *kadbi* and 49 lbs. chaff, being the contents of 215 bundles given to *balutedárs*;
42½ lbs. of *jowári* and 10½ lbs. of *kardai* seed sown.

There remained—

			Rs.	a.	p.
Jowári	686 lbs.	valued at	20	10	4
Kardai	1,031½ lbs.	do.	23	0	0
Kadbi	79 bundles	do.	1	9	4
Chaff	695 lbs.	do.	1	8	9
		Total ...	46	12	5

Against this there were expenses in cash:—

	Rs.	a.	p.
Hired labour	10	12	0
Oil-cake for four bullocks during working season ...	15	0	0
Local cess	0	3	0
Condiments at 10 annas per month	7	8	0
Oil at 12 annas per month...	9	0	0
Clothes	8	8	0
	50	15	0

Thus there is a deficit of about Rs. 4-3-0, besides Rs. 3 to be paid as assessment. This he must defray from the emoluments (Rs. 132) which he receives as *pátil*. He has no debt to pay. It must be remembered that the season was a very unfavourable one.

Second test.—(No. 40). This holding (area 20 acres 14 gunthas) also belongs to a *Marátha*; *jowári* and *kardai* covered the whole area. No hired labour was employed, every operation being performed by the occupant himself and two female members of his family. He owns five bullocks and borrowed five others, the loan being repaid by assisting the owners in ploughing their fields. Besides the field tested the occupant has two other fields, which he lets, and for each of which he receives Rs. 10 clear of all charges. His total income may be put down thus:—

Article.	Total yield.	Seed borrowed and repaid at 1½ times the original quantity.	Paid to village servants.	Home consumption (grain at 1½ lbs. per adult and *kadbi* at 5 bundles per bullock).	Net remainder.	Value of remainder.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.
Jowári	8,453	122	791	2,700	4,840	145 10 4
Kardai	1,774	30½	...	...	1,743½	38 14 1
Kadbi	*3,256	...	305	2,951	...	.....
Chaff...	1,628	...	152	...	1,476	2 14 1
						186 6 6

* Bundles.

Deduct expenses in cash :—

	Rs.	a.	p.
Kadbi for cattle, the home produce having fallen short	50	0	0
Oil-cake during working season	20	0	0
Condiments at Re. 1¼ per mensem	15	0	0
Oil at Re. 1 per month	12	0	0
Local cess	0	5	0
Clothing for the family	22	12	0
Total ...	120	1	0

Thus there is a balance of Rs. 66-5-6 from the holding, and after paying the assessment, Rs. 5, the occupant appears to have made in an unfavourable year a net profit of about Rs. 3 per acre. He has a debt of Rs. 75 to pay.

Poona.

Mr. C. P. B. Wiltshire, Assistant Collector.

Sends three tests, two on dry-crop wheat and one on potatoes. The first wheat test (No. 41), taken on land assessed at Re. 1-5-2 and growing wheat every year, gives a disappointingly low outturn, only 188 lbs. grain and 292 lbs. straw and chaff per acre. From the second field (No. 42), bare-fallowed the year before and assessed at a slightly lower rate, the results are a little better. The anna estimate of each crop is much too high. The fields probably carried average crops for the season, but poor rabi crops were general. The samples forwarded to my office show bushel weights of 64 lbs. and 65 lbs. respectively, which are high considering the low yields, which were only threefold the seed sown in the first test and fourfold in the second. But the seed-rate reported is suspiciously high.

Mr. Wiltshire tested potatoes (No. 43) at Chakan. This crop was the second of two potato crops following each other in the same year, a practice that cannot be commended being most favourable to disease by exhausting the soil. Owing to deficient rainfall the water in the wells generally failed before the cold weather potato crop ripened, and although the disease was less injurious than in the previous year, possibly from this cause, the crops were generally poor. Mr. Wiltshire's test shows an outturn of little more than a ton per acre, about ⅕th of what a fair crop ought to be. The land was liberally manured and well cultivated. The percentage incidence of assessment is low, because prices of potatoes are now very high. The gross value of produce amounts to Rs. 84-12-3 per acre, not enough to pay expenses. The seed-rate is stated at 547 lbs. per acre. This is about 350 lbs. less than the weight usually planted.

Mr. W. T. Morison, Assistant Collector.

Reports two tests on groundnut and wheat. The groundnut (No. 44) was grown on the poor *mál* land, of which there are large tracts in the Indápur subdivision. The experiment shows the capabilities of such land when helped by irrigation. The irrigation would have been more beneficial if the field had been manured. It was intended to measure the actual quantity of water applied to the crop, but arrangements were not made in time for this test. The crop was watered eight times and gave 415 lbs. unshelled nuts per acre, a poor result compared with similar crops grown on richer soils. The seed-rate is much understated, at 14 lbs. per acre. The assessment for the whole field is annas 3 per acre; but the portion under groundnut is decidedly the most fertile part of it and is estimated by the experimenter to be worth at least 6 annas per acre.

Mr. Morison's second test (No. 45) was on *khapli* wheat grown as a second crop after maize, a well reported experiment. The crop was grown on red land assessed at Re. 1-0-10 per acre, apparently the ordinary dry-crop rate, although the field is classed as *bágáyat*. Mr. Morison explains that the character of the soil had less to do with the satisfactory yield than the careful tillage, ample manure, and regular watering, which it received. Drilled in September, the crop was ripe on the 21st February, being meanwhile watered 20 times. The bumper outturn of 1,971 lbs. grain and 1,930 lbs. straw was estimated at 16 annas and had a gross value of Rs. 85-0-10 per acre. The seed-rate was 109 lbs. per acre.

Mr. Morison remarks: "the field was rented by a *Máli* from the registered occupant who was to receive ⅓rd of the produce in consideration of paying the Government assessment only", and he concludes that the assessment is rather low, considering that the land is classed as garden land and is situated just outside the large market town of Indápur.

Mr. J. Mollison, Superintendent of Farms.

Conducted two very careful tests on sugarcane near Poona. His first test (No. 46) is on very heavily manured *murum* land cultivated by a tenant at a high rent which under standing orders should have been stated. Town sweepings worth Rs. 3,000 and castor cake valued at Rs. 600 were used for 23 *bighas*, (about 16 acres), the manure applied thus costing about Rs. 225 per acre. This figure, the experimenter thinks, may not be altogether true, but he notes that the character of the soil is being changed by the addition each year of large quantities of manure. Accurate information regarding the various tillage operations and their cost could not be ascertained. Harvesting and *gul*-making was done by contract, the usual rate being Rs. 16 per ten *pallas* or 2,400 lbs. of *gul* turned out. To each mill 11 men and 8 bullocks are attached. The fuel was supplied by the crushed cane and stripped leaves. The tops are used as feed for the work bullocks and are not valued, though the contractors manage to feed a good many more cattle with them than those worked. 690 lbs. of cane, passed through an ordinary 3-roller Poona mill, yielded 434 lbs. of juice, which filled the receiver in 62 minutes. Allowing for necessary stoppages, sufficient juice can be obtained in 2 hours and 25 minutes to charge an evaporating pan of the shallow pattern, 7 feet in diameter. Each charge weighs approximately 848 lbs. and this quantity took 2 hours 53 minutes for conversion into *gul*, which weighed 176 ¾ lbs.

The second test (No. 47) was made on an experimental plot on the Government farm at Kirkee. Details of every operation and its cost were recorded in the cultivation book kept on the farm. All work, of course, is done by hired labour. The net result per acre may be summarized as under:—

	Rs.	a.	p.
6,740 lbs. of *gul* sold at Rs. 14 per 246 lbs.	383	9	2
2,843 lbs. of tops fed to farm bullocks (4) not used at the sugarcane mill	5	0	0
	388	9	2
Minus—			
Cultivation charges, manure, water-rate, assessment, &c. (for details *vide* Appendix)	344	7	0
Net profit per acre ...	44	2	2

The following statement compares the results in the two tests per acre:—

Details.	Experiment No. 1.	Experiment No. 2.
Number of canes cut	30,160	29,830
	Lbs.	Lbs.
Weight of canes with tops	65,480	63,180
Do. without tops	56,840	54,650
Weight of tops	8,640	8,530
Do. juice	35,780	39,610
Do. *gul*	7,280	6,740
Percentage of juice to cane topped	62·9	72·5
Do. of *gul* to do.	12·8	12·3

The high percentage of juice to cane in the second test is probably accounted for in part by the fact that the canes in this case were repeatedly watered after being cut, as, if allowed to dry, the sap becomes too concentrated to be properly extracted by pressure.

Judging by the results of these tests and of that taken last year at Mundhva, Mr. Mollison is of opinion that the outturn cannot exceed a maximum of 12,500 lbs.

of *gul* per acre. He remarks that it would be difficult with the best possible cultivation to get that yield off a whole field of any extent. Sugarcane is a risky crop subject to many mishaps. It may be injured by rats, jackals, white ants, &c.; and the sugarcane-borer is each year becoming more destructive.

Shola'pur.

None of the officers in this district reported experiments this year. Mr. Doderet's services were transferred early in February, and Mr. Brown was away with a Revenue Survey party.

Mr. Heblikar, District Deputy Collector, conducted a test in *jod* wheat, but before he could record the results, he discovered that the owner of the field had tampered with the produce, which rendered the test worthless. No other test could be undertaken owing to press of work in connection with the introduction of revision survey in Málsiras and with takávi advances. The season was also extremely adverse to experiment.

Sa'ta'ra.

Four experiments, three in groundnuts and one in sugarcane, have been received from this district. Messrs. Pánse and Fawcett conducted only one test each, and Mr. Fry two. No explanation has been received of the omission to experiment by Mr. Scott, District Deputy Collector.

Mr. G. D. Pánse, Assistant Collector.

Submits a groundnut test (No. 48) carefully conducted and fully reported. The field belongs to a money-lender, who has kept an exact account of the outlays connected with this crop.

Cost of cultivation of ground-nut crop. Area 1 acre 3 gunthas.

Operation.		Labour Per Day.		Cost Per Day.		Total Labour.			Total Cost.
Number.	Description.	Men.	Bullocks	Men.	Bullocks.	Men.	Bullocks.	Days.	
				A. p.	A. p.				Rs. a. p.
I	Ploughing at end of April ...	3	10	2 6	3 0	4½	15	1½	3 8 3
II	Clod-crushing...	1	4	2 6	3 0	½	2	½	0 7 3
III	Manuring—								
	(*a*) 10 cart-loads of manure at 8 annas per cart ...	...	...	...	...	...	...	...	5 0 0
	(*b*) cartage to field ...	...	...	...	...	...	...	...	1 2 0
	(*c*) spreading the same ...	2	...	2 6	...	2	...	1	0 5 0
	(*d*) sheep-folding, 300 sheep for 3 days at Rs. 2-1-4 per day ...	...	...	...	...	...	...	...	6 4 0
IV	Harrowing	1	2	2 6	3 0	¼	½	¼	0 2 1½
V	Sowing—								
	(*a*) 40 sers of husked seed.	...	...	...	...	...	...	...	5 0 0
	(*b*) sowing the same ...	6	4	2 6	3 0	3	2	½	0 13 6
VI	Hoeing...	1	2	2 6	3 0	1	2	1	0 8 6
VII	Watering—								
	(*a*) 8 waterings of 1½ days each	2	4	2 6	3 0	24	48	12	12 12 0
	(*b*) proportionate cost of mot, rope, &c., and repairs	...	...	...	...	...	...	...	7 4 0
VIII	Hand-weeding (3 weedings)...	8	...	2 6	...	24	...	3	3 12 0
IX	Watching, no cost, being done by man at the mot	...	...	...	...	...	...	...	...
X	Harvesting—								
	(*a*) Digging	4	10	2 6	3 0	4	10	1	2 8 0
	(*b*) Removing *vel*... ...	10	...	2 6	...	2½	...	¼	0 6 3
	(*c*) Removing ground-nuts	20 women.	...	1 6	...	50 women.	...	2½	4 11 0
	(*d*) Cartage to occupant's house...	...	...	...	...	...	...	...	0 12 0
XI	*Balutas* (12 in number) ...	...	...	...	...	...	...	...	1 4 0
	Total ...	...	...	...	...	...	...	...	56 7 10½
								Therefore cost per acre ...	52 8 9¾

The whole field measures 21 acres and 9 gunthas, of which 1 acre and 3 gunthas was under groundnut. Over this area 10 cart-loads of farmyard manure were spread and 300 sheep folded during three nights. The crop, according to figures stated, would realize Rs. 159-11-7, showing a clear profit of Rs. 95 per acre, but prices were abnormally high. The crop was grown on rich black soil assessed at Re. 1-15-8 per acre. It was watered eight times from a well which was recently dug. The land was deeply ploughed in the hot weather and 96 lbs. per acre of seed (a high rate) was drilled in the rains. The crop ripened in January, being meanwhile once bullock-hoed and three times hand-weeded. The crop produced 4,032 lbs. per acre of unhusked nuts (*shenga*) equal to 3,024 lbs. husked nuts (*dáne*). The haulm, termed *vel* (a useful fodder), was estimated to be worth Rs. 10 per acre.

Mr. C. G. H. Fawcett, Assistant Collector.

Sends in one carefully reported test (No. 49) on groundnut. The field selected forms part of a Deshmukhi *inám* land which pays a *judi* of annas 5 in the rupee. Of the total area (4 acres 15 gunthas) one acre and two gunthas is classed as dry-crop and the rest *bágáyat*. It is, however, curious to note that the rate of assessment on the dry-crop portion is higher than that on the garden land even after inclusion of the water-cess, Rs. 15. The plot experimented upon is watered by a *pát* fed by a *dharan*, the occupant's turn occurring every 18th day. The crop, however, was watered only twice and this reduced the yield to 12 annas (though estimated at 16 annas). The field was liberally manured with farmyard manure and sheep folding, a favourite practice for this crop. The incidence of assessment is 7·29 per cent., and would have been higher if ordinary market rates had ruled. The fodder, 3,460 lbs. per acre, is estimated to be worth Rs. 15 owing to the same high rates consequent upon the prevailing scarcity.

Mr. T. D. Fry, Assistant Collector.

Submits a groundnut and a sugarcane test. The groundnut experiment (No. 50) is not satisfactory. The crop was grown on rich brown soil assessed, soil and water-rate together, at Rs. 6-1-3 per acre. The outturn of nuts in shell comes to 345 lbs. per acre, about one-tenth of a fair crop, attributed to deficient rainfall. The seed, about half the usual quantity, was broadcasted. This prevented bullock-hoeing, and hand-weeding seems to have been neglected. The cultivation was admittedly careless and experiments on fields badly managed should be avoided.

For the sugarcane test (No. 51) the experimenter selected a holding in one of the hill-side villages of Jávli, where sugarcane does not thrive so well as in the Desh. The field gets water twice a month throughout the year from a *dharan* fed by a *nála*. This would not suffice for sugarcane, which requires watering every eighth day. The rainfall was poor and the crop suffered accordingly. Estimated at eleven annas it only yielded 1,948 lbs. of *gul*. The date of planting is not given, but the results indicate that the crop was not fully ripe when harvested, the percentage of tops to cane (about 33 per cent.) pointing strongly to this conclusion. When water fails this course often becomes necessary, and the practice has been frequently noted. The experimenter's results are summarized for comparison with other tests as under:—

Number of canes cut	25,430	per acre.
Weight of canes topped	18,034 lbs.	„
„ „ tops	9,017 „	„
„ „ juice	10,460 „	„
„ „ *gul*	1,948 „	„
Percentage of juice to topped canes	58	
„ *gul* to juice	18·6	
„ *gul* to cane	10·8	

SOUTHERN DIVISION.

Belgaum.

Four ordinary experiments on rice have been reported from this district, three by Mr. DuBoulay and one by Mr. Brown. One of the three Mr. DuBoulay intended to be special, but the opportunity was lost. Mr. Brown conducted two ordinary tests in December, but did not report them. The Collector called for the papers but only one experiment was recovered, the papers regarding the other being missing. The District Deputy Collector was asked to conduct tests in linseed, but the crop failed owing to seasonal causes. No experiments on second crops of rice fields could be effected, owing to the same cause.

Mr. J. H. DuBoulay, Assistant Collector.

Submits three ordinary tests (Nos. 52—54) all on rice, each crop raised from seed drilled by a six-coulter drill, the seed-rate being in each instance 92 lbs. per acre. Each field is stated to have been manured with cowdung and green grass after the crop was sown, a statement probably erroneous. All three fields have red soil, assessed at about equal rates, Rs. 5-1-0 to Rs. 5-9-3 per acre. The crops were purely rain crops excepting the third, which had the untaxed advantage of an occasional flooding from an adjoining tank. The rainfall was unseasonable though not short. Each field grows the same variety of rice, *dodd bhatta*, and usually carries a second crop *vál*, but this year insufficient moisture remained in the soil to allow of a second crop being taken.

The third test gave the best results. The cultivation of this field is described as good, that of the other fields as indifferent. The crop, which must have been much under-estimated at 13 annas, gave an outturn of 3,025 lbs. grain in husk per acre. The seed was sown at the end of May and the crop was ripe in November. Prices went up with a run soon after the experiments were taken, so that the value of produce recorded is probably a good deal less than the actual prices obtained this year by the cultivator.

The outturn of rice in the Khánápur táluka, where these tests were taken, was only 10 annas, and the crops selected must have been considerably over average. The yields given are from $2\frac{1}{2}$ to $3\frac{1}{2}$ times those of the formulæ which place the highest outturn for drilled rice at 2,000 lbs. Under the circumstances I should suspect these crops to be plantation rice, had not the experimenter distinctly stated it to have been drilled in each of the three tests.

Mr. C. D. Brown, Assistant Collector.

The rice experiment conducted by this officer was submitted by his successor Mr. Boyd and received in this office only at end of November last. I feel some hesitation in recording the results. The field selected grew rice continuously "mixed with $\frac{1}{144}$ part of tola *hingári* or rabi crop". This remark is not understood. The land was manured with three cart-loads of cowdung per acre, a rather low rate, a month before sowing; and rice was drilled directly at end of June, not rábed or transplanted. The rain, on which the crop depended, is described as untimely. The estimate of 37 lbs. seed per acre is very low, the general average, according to the formulæ, being 100 lbs. The crop yielded 688 lbs. of paddy and 1,480 lbs. straw per acre, estimated by the experimenter at only 5 annas, but, compared with the formulæ standard, it must be valued at 10 annas at least. The value of the crop came to Rs. 29-14-8 and the percentage incidence to 18·43, which, considering the high prices prevailing, seems extraordinarily high. No sample was sent to this office as required by standing orders. The report is altogether meagre and under all circumstances I must exclude this test.

Bija'pur.

Only a part of the programme could be followed in this district, the tests reported being all in *khapli* or *jod*, an irrigated wheat. Neither Mr. Hervey, the Second Assistant, nor Mr. Deshpánde, District Deputy Collector, made any experiments. As early as the 8th of October, Mr. Davidson, the Collector,

wrote :—"The season, however, has been such an extraordinary one, there only being sufficient rain to keep the crops alive without allowing them to come forward, that even now, though they are green and fairly healthy, I am unable to judge whether they will be moderate crops or absolute failures." Later on (11th June) he says that "owing to the failure of crops it was found impossible to make any experiments that would have been of any use, and with crops as a rule averaging 2 and 3 annas, the time spent on them would have been thrown away and the results would have been of no use."

Mr. W. C. Rand, Assistant Collector.

This officer sends two careful tests (Nos. 55 and 56) of spelt wheat grown on fields classed partly as dry-crop and partly as garden land, though usually growing a dry-crop unless when the season is unpropitious, as in the present instance. Each field was manured in the hot weather of 1891, and, as the fields remained fallow till November, the inference is that with a favourable rainfall the cultivators had intended taking kharif crops. The tests deserve careful analysis and comparison. The actual tillage operations are not recorded, but in each case the cultivation is described as good. The field in the 1st test (No. 55) had the advantage of sheep being folded on it, but whether the droppings were sufficient to furnish a liberal manure is not stated. 95 lbs. seed per acre broadcasted in November grew into a 20-anna crop which was harvested at end of February and produced 1,168 lbs. husked grain per acre. 70¾ measure sers of grain in husk produced 31¾ measure sers of clean grain. For this crop a full supply of well water was available. The soil is red-black (*maddi*) and is assessed at Re. 1-6-10 per acre. The second field (No. 56) bears an assessment of Rs. 2-6-11 per acre, the soil being light in colour, locally termed *mardi*. This field was liberally manured with cowdung, 30 cart-loads per acre. I doubt the accuracy of the seed-rate; 210 lbs. per acre is an excessive estimate even for an irrigated spelt crop. The field grew chillies and late *jowári* during the last two years. Broadcasted in November, the crop was reaped on the 1st of March and produced 1,137 lbs. of grain worth, without by-products, Rs. 55-5-0 per acre. The value returns of both fields are of course raised by the famine rates prevailing. . The straw and chaff, of low value as fodder, are usually unsaleable, but the experimenter notes that in a season like that of 1891-92 they would probably fetch a price. However, he has not valued them, though Mr. Cursetji in the next experiment values the by-products (apparently too highly) at Rs. 8 per acre. 73¼ measure sers of grain in husk from the 2nd field gave 31½ measure sers of clean grain.

Mr. J. M. Cursetji, District Deputy Collector.

This officer's test (No. 57) on *khapli* (spelt) wheat furnishes some useful information not recorded in Mr. Rand's experiments (Nos. 55 and 56). Mr. Cursetji shows that a measure ser of grain in husk, weighing 51 tolas, gives 40 tolas of clean grain and 11 of husk. The experiment was taken on a field having an entire area of 17 acres 16 gunthas, of which 7 acres is garden land. The whole is assessed at Re. 1-5-6 per acre, but is sublet by the registered owner at about Rs. 7 per acre. The tenant has the full use of a large well which apparently gives water sufficient for the whole of the garden land. The wheat occupies the same area always; the sugarcane and other crops are rotated. The seed-rate figures corrected in my office show that 104½ lbs. grain in husk was broadcasted in *Ashvin* (September—October) immediately after an application of 13 loads ordinary manure.

The crop, estimated at 14 annas, produced 1,381 lbs. per acre grain in husk, equivalent to 1,084 lbs. clean grain. The straw and chaff weighed 1,161 lbs. per acre. This, with the principal product, had a gross money value of Rs. 73-5-8. The experimenter values the by-products at about Rs. 8 per acre. Ordinarily the straw and chaff of this wheat (*khapli*) is not used as fodder. Though it must have been used in the present year owing to scarcity of fodder, the value put upon it seems rather high (about 144 lbs. per rupee). The incidence of assessment is lowered by the high rates of value during the year.

Mr. Cursetji attempts to estimate the profits from the whole field; but his calculations are based on hearsay evidence and at the best are only approximate. The test is, however, carefully made and well reported.

Dha'rwa'r.

Three officers from this district send one experiment each. Of these, two are on *navani* in the *mallád* and one on sugarcane. Thus the programme was only partially followed. Neither Mr. McNeill nor Mr. Kánga, District Deputy Collector, made any experiments. The latter was exempted as the crops in his charge were generally failures. In the eastern parts of the district this was largely the case everywhere, and Mr. Enthoven was from this cause prevented from carrying out the prescribed experiments.

Mr. R. Knight, Assistant Collector.

Sends one test on *navani* or Italian millet. The experimenter observes that *navàni* is grown to a very small extent in Dhárwár and he had considerable difficulty in finding out a field under it. But during the year under report it occupied 73,700 acres in the Dhárwár district, of which no less than 8,900 acres were in this táluka. Dhárwár stands first in the Presidency in respect of this crop, as it occupies one-third of the total area cropped under this cereal. The soil was mixed red and black, assessed at Rs. 2-4-3. The cultivation of this staple is mainly confined to the poorer soils of the *mallád*, and this experiment is therefore not a representative one. Moreover, the rule as to minimum area of test has not been observed. The grain is not a luxury as reported, being a staple food-grain of the poorer classes, though occasionally used in the preparation of richer mixed foods.

The experimenter first selected three patches to represent the average of the field; afterwards he considered that the two best plots fairly did so. On this assumption the outturn of grain comes to 201 lbs. per acre, which, with the fodder, had a market value of Rs. 6-11-4 per acre. This classes the crop at 9 annas. Taking 16 annas as a bumper, the experimenter classes it at 6 to 8 annas, but raises his estimate to 14 annas with the standard of a bumper at 20 annas. These proportions, however, vary and the estimate is apparently meant to be 8 to 10 annas. The seed, 1½ lbs. per acre, an abnormally low rate, ordinarily drilled in June-July, was not got into the ground until the end of August. The season was abnormal and I attach so little value to the figures reported that the experiment must be excluded.

Mr. R. E. Enthoven, Assistant Collector.

Sends a sugarcane test (No. 58), a test always entailing a good deal of labour. This officer's test was made under close personal supervision and is well reported. The crop was grown on an average black soil field below the large Hirekerur irrigation tank. The crop was not quite even and was cut in two plots, that in the centre of the field yielding a much larger outturn of *gul* than the other taken in a low-lying corner. An average of the return from each shows the produce per acre to be 3,590 lbs. of *gul*. The top ends of all large canes appear to have been saved for sets for replanting. This, an economical practice, somewhat reduced the outturn of *gul*. About 20,000 top ends were saved from one acre sufficient to give sets for an equal area. The crop is estimated at 18 annas, but it does not reach that standard. Near Poona, where the cost of manure alone exceeds the total cost of production of this crop, it would have been estimated at 9 annas. Mr. Enthoven's estimate of sets planted is not correct, as the price indicates that 3,000 canes and not sets were used in planting an acre; 16,000 to 20,000 sets are always required.

		Rs.	a.	p.
The experimenter estimates the by-products to be worth	...	26	14	0
Add value of *gul*	...	210	0	0
Total	...	236	14	0
Deduct estimated cost of production	...	88	5	10
Profit per acre	...	148	8	2

The land is assessed at Rs. 7-8-0 per acre and was by no means liberally manured with 5 cart-loads per acre of cowdung and sheep folded on the field for two days before planting. The cultivation was only fair. The crop gave evidence of insufficient weeding and the field was only once ploughed. I cannot

accept the experimenter's estimate of cost of production. Some of the details are approximately right, others are clearly wrong. One item is conspicuously high, *viz.*, cost of spreading 10 loads of manure, Rs. 5. The crushed canes and stripped leaves ordinarily do furnish sufficient fuel in the boiling process. It is not stated whether the green tops provided a surplus besides full fodder for the cattle working the mill as is usual.

Mr. C. C. Boyd, Assistant Collector.

A good experiment on Italian millet (No. 59) is reported by this officer. The conditions of cultivation and yield per acre were nearer average than those of Mr. Knight's test. This staple is a five-month crop grown by the poorer cultivators on light land. It affords an early provision of food for themselves and fodder for their cattle, and is especially useful in years of scant raintall. The crop was grown on red land assessed at Re. 1-6-10 per acre, growing *jowári* and *navani* in alternate years. The field gets a light dressing of manure every year and the cultivation may be characterised as fair. About 8½ lbs. seed drilled in August produced a crop in December estimated at 12 annas, but 14 annas according to the formulæ. It yielded 422 lbs. grain (bushel weight 56 lbs.) and 1,950 lbs. chaff and *kadbi* per acre. The season was not unfavourable at the place of experiment and an influx of cattle from the distressed parts to the *mallád* raised the price of fodder considerably; still the gross value per acre only amounts to Rs. 12-11-3 with a percentage incidence of 11·23 which under the circumstances is rather high.

Kolaba.

Four experiments have been received from this district, all on transplanted rice, three by Mr. Orr and one by Mr. Bhángáonkar. The latter officer was asked by the Collector to conduct a special experiment and his explanation of his omission to do so is regarded by the Collector as unsatisfactory. Mr. Orr states that he could not undertake tests in second crops after rice, because, as he says, they are rare in the neighbourhood of Roha (where he conducted his rice experiments) and this year particularly so on account of failure of late rains.

Mr. J. P. Orr, Assistant Collector.

Three well conducted tests on sweet rice in Roha are reported with unusual exactness and appreciation of practical details. This officer's tests had the object of gauging the comparative effect of good and inferior ráb practice, *i.e.*, to compare the effect of a liberal application of cowdung ráb on the seed-bed with a less quantity of cowdung supplemented by brushwood, grass or other forest litter. The results were not conclusive owing to the fact that, as the experimenter says, "it is very difficult at so distant a date to get from the cultivators accurate and trustworthy information as to the materials they used, and I should not again attempt such an experiment without having watched the rábing process from its commencement in January or even earlier." He says that rábing with leaves and grass alone, common in the Thána district, is unknown in Roha, cowdung being invariably used with superposed layers of other material. The quantity of material used seems to be the chief factor.

The field in the first test (No. 60) has good soft soil, a foot deep, and grows rice every year. With good cultivation and a most favourable season the crop is estimated at the bumper standard (but 16 annas according to the formulæ). A seed-bed of 2 gunthas had the following ráb material laid upon it:—

December 1890	...	40 small baskets of cowdung spread;
January 1891	...	140 small bundles of rice straw,
		4 head-loads of chaff, and
		4 do. grass piled in succession.

Sifted earth was sprinkled over this and moistened with water. The whole was burnt at end of January. With a seed-rate of 56 lbs. per acre, broadcasted in June, the bed gave seedlings sufficient for 17½ gunthas. This is a ratio of 4⅘ gunthas seed-bed per acre of transplantation. The field is assessed at Rs. 6-4-7. The crop was harvested on 23rd October and produced 2,403 lbs. grain in husk and 1,915 lbs. straw per acre.

The 2nd field (No. 61) with shallow soil (*murum* within 8 inches of surface) is assessed at Rs. 4-14-7. Excepting management of seed-bed, other conditions of cultivation, &c., were identical with the former test.

On the $3\frac{3}{4}$ guntha seed-bed a thin layer of cowdung with grass, straw, and earth layers above it was burnt in February. 44 lbs. seed per acre, broadcasted in June, provided seedlings sufficient for 35 gunthas of transplantation. In view of the inferior character of the soil the experimenter estimates this crop also at the bumper standard (14 annas according to the formulæ). It produced 1,953 lbs. grain and 1,926 lbs. straw per acre. The incidence of assessment is slightly less than that in the previous test.

Mr. Orr's third test (No. 62) brings out facts of importance. The field was selected because it was known that the seed-bed had been well rábed. No comparison can, however, be instituted between this and the previous two tests, as subsequent to the experiment it was found that the field is reclaimed *varkas* land, the cultivator spending Rs. 60 on $1\frac{1}{2}$ acres on the reclamation during the last eight years. The assessment is only annas 4 per acre. This class of land requires a proportionally larger seed-bed than ordinary rice land, *viz.* $8\frac{2}{3}$ gunthas for 1 acre of transplantation, and the seed is more sparsely scattered, at a rate of about 60 lbs. per acre. On a $3\frac{1}{4}$ guntha seed-bed the following ráb material was used :—

February 15th to 29th...(1) Dung of 19 cows and bulls, collected by cowherd during 15 days forming a thick lower layer,
End of March ... ...(2) 30 head-loads of grass forming a layer 4 inches thick,
April 3rd ... ...(3) Earth moistened with water, forming an upper layer, put on immediately before burning.

The crop was harvested on 26th October and produced 1,916 lbs. grain and 1,816 lbs. straw per acre. This crop also is estimated at the bumper standard (14 annas according to formulæ).

Mr. K. N. Bhángáonkar, District Deputy Collector.

Forwards one test (No 63) on transplanted rice. The figures are worked out with care, but the report is wanting in detail. It is not clear whether the seed-bed or the field was manured; 7 cart-loads per acre were applied in April-May, presumably to the latter. The experimenter failed to ascertain the seed-rate with accuracy. The area of seed-bed per acre of transplantation is not given and without that datum I do not see how the experimenter arrived at his figures.

The land is assessed at Rs. 5-11-2 per acre and grows sweet *halva* rice every year. With a favourble year and good cultivation the outturn, 2,547 lbs. grain in husk and 2,943 lbs. straw per acre, is estimated at the bumper standard. The incidence of assessment is not high and might be lowered by growing a secondary crop.

Ratnagiri.

Mr. A. M. T. Jackson, Assistant Collector.

Two tests by this officer furnish information which supplements that obtained last year regarding coarse hill millets grown on upland *varkas* land. Mr. Jackson's experiments were taken on two *nágli* crops, one grown from transplanted seedlings, the other from seed broadcasted in the field. The results prove that a rábed seed-bed is as advantageous in *nágli* cultivation as for rice.

The first crop tested (No. 64) was grown from seed broadcasted in June, $22\frac{1}{2}$ lbs. per acre *nágli* with a slight sprinkling of *vari*; a higher seed-rate than last year's tests indicate as general. The field was fairly manured with goat droppings and cowdung. With an indifferent season and fair cultivation the outturn is estimated at 10 annas and amounts to 542 lbs. grain and 637 lbs. straw per acre. The estimate is evidently based on the capabilities of such land under the conditions of cultivation described. This field appears only to be able to grow *nágli* followed by *harik* after five years' fallow. After two years' cropping it is again fallowed. The field was three times ploughed before the seed was sown in June. The crop was ripe in November.

The second test (No. 65) was taken on land assessed slightly higher and cultivated by a tenant. The seed-bed was rábed with cowdung, tree loppings and grass. The proportional area of seed-bed to area of transplantation was $8\frac{1}{4}\frac{6}{3}$ gun-

thas to an acre. Seed at the rate of 3 lbs. per acre was broadcasted after once ploughing the seed-bed; while the seedlings were growing, the rest of the field was ploughed four times. Six weeks after sowing, the seedlings were transplanted into holes made at regular intervals presumably in the ordinary way with a pointed stick. A piece of dried fish, *kuta*, half filled each hole. The crop was harvested on 23rd October and produced 1,348 lbs. grain and 2,092 lbs. straw per acre. This crop is evidently under-estimated at 12 annas, judging by the tests of last year and by other tests this year.

Nágli is usually stacked for some months to improve the quality of the straw. It is then threshed either by flailing with sticks or by treading with bullocks.

Mr. L. N. Ajgáonkar, District Deputy Collector.

This officer, whose tests last year furnished a good deal of useful information regarding the hill millets, has again experimented upon the same crops. Regarding the peculiar methods of cultivation there is little to add to the description given in the report of 1890-91. The area in the first two tests falls short of the prescribed minimum. To avoid this he forms them into one test; but though the fields form part of the same survey number, the *phálni* numbers are different and bear different rates of assessment. There are also differences in treatment, cultivation and outturn. They may, however, be admitted as they supplement the information recorded last year.

Mr. Ajgáonkar's first test (No. 66) is taken on *nágli* grown on sloping land so steep that heavy rain washed away the dressing. A 7-guntha seed-bed broadcasted with $5\frac{1}{3}$ lbs. seed furnished seedlings sufficient for one acre. A top dressing of fish manure was applied to the field when the seedlings were transplanted. It is not clear whether this manure was washed away by heavy rain or the ráb from the seed-bed. The field is assessed at Re. 0-3-9 per acre and grows *nágli, vari* and *harik* after 7 years' fallow. The crop, carelessly cultivated and not weeded, produced only 427 lbs. grain and 920 lbs. straw, too highly estimated at 13 annas.

On a level field with stony soil, *nágli*, the subject of this officer's second test (No. 67), gave much better results. This land after three years' fallow grows during the next three years *nágli* followed by *harik* and *vari*. It is assessed at Re. 0-4-1. The seed-bed and seed-rate were proportional to those of the first test. The seedlings were transplanted into holes with, as usual here, a piece of dried fish placed in each hole, 10 maunds per acre of dried fish *(kuta)* being applied in this manner. The crop was ripe on the 6th November and produced 845 lbs. grain and 1,344 lbs. straw. It is not understood on what principle the experimenter gives this crop the same anna valuation as the last, unless it be that because the field is flat it is less liable to be swept by flood water and consequently more valuable.

The recuperative value of lengthened periods of rest to *varkas* lands is borne out by a third test (No. 68) also on *nágli*. The land is said to have lain waste for 35 years and during that period presumably furnished ráb from scrub growth and grass, besides grazing. Preparatory to tillage the scrub (*kaval*) was cut, laid regularly over the whole area, and when dry was burnt. The land is assessed at Re. 0-3-6 and owing to its slope was dug by hand in place of ploughing. Seed was broadcasted a month before the monsoon at about 12 lbs. per acre. The crop was weeded thrice, once in July, once in August when blanks were filled up, and again in September. The crop was harvested on the 9th of November. In a favourable season the produce, 867 lbs. grain and 1,660 lbs. straw per acre, classes the crop according to local estimate as a 12-anna one.

Mr. Ajgáonkar's fourth *nágli* test is omitted. It is admitted that the crop was damaged by cattle trespass, and it should not have been selected for experiment.

Two further tests deal with *harik*. The first crop (No. 69) was grown on land assessed at 5 annas per acre which grows *nágli, vari* and *harik* after a five or six years' rest. The second crop was raised on rocky land assessed at Re. 0-3-1, which grows *nágli, harik* and *vari* after a similar fallow. Each field was unmanured and broadcasted with equal seed-rates, 12 lbs. per acre. This

rate does not tally with that given for similar crops by the same officer last year (61 lbs. per acre), the present rate being probably about right. The rate given by the formulæ is 9 lbs.

The higher assessed land produced 834 lbs. grain, the other 487 lbs. per acre. These figures class the crops at 14 and 12 annas respectively. The cultivation was good, but rainfall short, both crops suffering from this cause. The inferior crop suffered further from a poisonous weed *agya*, which is most troublesome in years of scant rainfall.

Kanara.

Only one officer, Mr. Hudson, submits experiments from this district. Mr. Divátia explains that his late arrival in the district (20th January) and the exigencies of his tour prevented him from securing a suitable crop. No explanation has been received as to Mr. Sheppard's failure to experiment.

Mr. C. W. Hudson, Assistant Collector.

Submits green gram and sugarcane tests. The tabulated figures showed errors of calculation which were corrected in my office.

Green gram (No. 71) was a second crop after rice. The cultivator grows double crops of rice for two consecutive years, and in the third year substitutes a pulse for the second rice crop. Hardly enough moisture remained in the soil to mature the gram properly, but the outturn (450 lbs. pulse per acre) was not low. The incidence of assessment is necessarily high, being on a second and subsidiary crop. The cultivator probably looks less to the outturn than to the well understood ameliorating influence of leguminous crops, which leave in the soil a residue of recognised manurial value to the cereal crop (rice) next taken.

Mr. Hudson reports a novel method of utilizing the chaff of green gram. He says: "The dry husks or *hottu* are mixed with grass and soaked for a couple of days or so in water. The fodder thus yielded is most nutritive and valuable in a tract of country where grass by itself is so poor."

Mr. Hudson's second test (No. 72) is taken on sugarcane, grown on rice land assessed at Rs. 4-4-8 per acre. A *nála* available for irrigation skirts the field. The whole plot of cane grown on this particular number was tested. The area is less than the minimum allowed by standing orders, but under the circumstances this need not be objected to, more especially as headlands of sugarcane are almost invariably damaged by theft, jackals and rats, due allowance for which is difficult in testing a large crop. The crop was near a dwelling and for this reason got more attention and was less open to damage than a crop growing in a remote field. The field carries double crops of early rice and sweet potatoes in three consecutive years followed by sugarcane during next two years. The crop tested got evidently every attention and was liberally managed, but I cannot follow the experimenter in his details of cultivation and of estimated cost. The crop may have been a ratoon crop, *i.e.*, grown from the stools of the previous crop; otherwise the preparatory tillage in removing old stumps, in ploughing, and in preparing the land for replanting, would have cost much more than the sum shown in the report. The item for planting sets conflicts with this, unless it refers to filling blanks with sets, and then the charge is much too high.

The results of the test work out as under :—

	Yield from 2⅜ gunthas.	Acre rate.
Number of canes	1,784	26,760
Number of canes each furnishing from top end a "seed top" or set for replanting.	1,425	21,375
	lbs.	lbs.
Weight of juice	3,200	48,000
Weight of green tops	568	8,520
Weight of liquid jaggery	618⅞	9,283
Percentage of above to juice		19·34

	Value per acre. Rs. a. p.
Value of liquid jaggery	292 8 0
Value of seed tops (estimated at double the ordinary rate)	85 8 0
8,520 lbs. of green tops not valued by experimenter, worth, say	12 0 0
Dry leaves, crushed canes, all utilized as manure, also not valued; say	15 0 0
Total ...	405 0 0

Liquid jaggery must of course weigh more than *gul*, the usual product, but what the proportional weights would be is not known. The cultivator, it is interesting to note, used wood and brushwood as fuel in the boiling process, rather than utilize the dry leaves and crushed cane for this purpose. These he spreads over the cropped area and burns as an inferior rab. The crop tested was partially manured in this manner with the litter of the previous crop. This was done probably before the plough was used to stir the soil between the rows (if the crop was a ratoon one), although the experimenter says after, but the report leaves this in doubt. A little before the rains set in, a further top dressing of mixed cowdung and leaves was given, and at the same time the ash of earth and rubbish burnt together (*sudádhulu*) was applied.

The crop was only once weeded. The leaves were wrapped thrice. This practice lessens damage by jackals and renders the crop less liable to be lodged by heavy rain or wind.

The following is the experimenter's estimate of cost of production, but I cannot accept the figures as at all accurate:—

Charge for 2⅝ Gunthas.		Per acre.	
Details of Cultivation.	Rs. a. p.	Rs. a. p.	
1 Ploughing, 2 pairs of bullocks with two men for one day.	0 12 0	11 4 0	
2 Levelling, 2 men for one day	0 6 0	5 10 0	
3 Manure—			
Cowdung	0 8 0	7 8 0	
2 men preparing manure (*sudádhulu*)	0 6 0	5 10 0	
4 Sowing—			
Cost of seed (½ of the initial cost)	2 0 0	30 0 0	
2 coolies for one day	0 6 0	5 10 0	
5 Fencing, fence used for 5 years and cost Re. 1-14-0 ...	0 6 0	5 10 0	
6 Weeding and wrapping canes in their leaves—			
8 coolies working one day	1 8 0	22 8 0	
7 Watering 2½ months on alternate days, 4 hours' work a day	3 8 3	53 11 9	
8 Watching, no cost incurred being near home ...	.....	.....	
9 Cutting canes, 4 men one day	0 12 0	11 4 0	
10 Milling canes and making jaggery—			
Hire of bullocks and 4 men...	1 8 0	22 8 0	
Hire of pan	0 8 0	7 8 0	
Firewood, 4 men fetching one day	0 12 0	11 4 0	
	13 4 3	198 15 9	

TABULAR SUMMARIES.

Summary of Crop Experiment

O. S.=Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate, in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	AHMADABAD. *Mr. G. S. Curtis, Assistant Collector.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
1	Daskroi (Dariápur Kájipur)	Wheat (Vájia), 9th March 1892.	11	1,000	164	2,051	25 bundles.	76 4 0	5 12 2 R. S.	7·55	0 4
	Mr. Bamanji Edalji Modi, District Deputy Collector.										
2	Dholka (Saroda)	Rice (Sutarsál), 11th November 1891.	15	1,825	..	1,526 in husk.	1,680	41 4 8	4 0 0 R. S.	9·68	0 5
3	Sánand (Visálpur)... ...	Do. 24th November 1891.	14	1,710	19¾	1,042 Do.	1,768	29 11 4	6 5 10 O. S.	21·42	0 5
4	Sánand (Sánand)	Do. (Kamod), 27th November 1891.	12	1,460	20	951 Do.	2,460	40 12 6	5 4 6 O. S.	12·95	0 4
5	Do. do.	Do. (Sutarsál), 27th November 1891.	14	1,710	20	1,561 Do.	2,050	52 8 10	5 13 10 O. S.	11·16	0 4
	KAIRA. *Mr. H. R. Cooke, Collector.*										
6	Mátar (Ratanpur)... ...	Kodra (Paspalum scrobiculatum) with a sprinkling of tur and juvár, 5th November 1891.	10	845	15	1,003	...	23 6 2	4 0 0 O. S.	17·10	0 8
7	Mátar (Wansar)	Bávto (Eleusine coracana) with a sprinkling of juvár and red juvár, 6th November 1891.	12	1,240	2	1,300	...	33 15 4	2 12 1 O. S.	8·11	0 8
8	Mehmadabad (Kaira) ...	Kodra (Paspalum scrobiculatum) with a sprinkling of sheria, bhendi, tur and red juvár, 9th November 1891.	6	450	10⅔	763	...	18 10 7	3 8 3 O. S.	18·84	0 8
9	Do. do. ...	Bávto (Eleusine coracana) with a sprinkling of cotton and red juvár, 9th November 1891.	12	1,010	3 About	1,299	...	36 14 5	4 1 3 O. S.	11·05	0 8

Reports, Northern Division, 1891-92.

R. S.=Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
Weight Ser=40	29 1/11	3 1/8 bundles.	*Experiment No. 1*.—Wheat, *vájia* (soft-red), on a *gorádu* soil manured with 20 cart-loads of cowdung and watered by means of a well. The crops grown during the two previous years were:—(1) *bájri* and barley and (2) vegetables and maize. Cultivation good. Crop a full bumper but estimated at 11 annas only. By-product not weighed though value included in column 9. Seed-rate higher than that in the formulæ. Incidence on the second crop only.
Do. ...	41 in husk.	3 5/8	*Experiment No. 2*:—Rice, *Sutarsál*, on a *besar* soil growing annually rice followed by barley. Usually manured with 8 to 16 cart-loads of farmyard manure but none put in this year. Cultivation good but the late rains being deficient the crop had to be irrigated from a well three times at intervals of 10 days. Seedlings purchased and seed-rate not known. Yield estimated at 15 annas (equal to 1,825 lbs. according to formulæ) but actual yield low. Incidence of assessment on the 1st crop alone.
Do. ...	Do. ...	Do. ..	*Experiment No. 3*:—Same variety on a *gorát* (sandy loam) soil growing continuous rice but occasionally barley also. Not manured this year. The crop suffered as elsewhere from deficient rain and was watered four times from a well at intervals of 15 days. The well-water was brackish and is said to have injured the quality of grain slightly. Area of seed-bed not ascertained. Yield much below the formulæ. Incidence of assessment high, partly explained by a poor crop.
Do. ...	27 1/3 Do.	Do. ...	*Experiment No. 4*:—Rice, *kamod*, on *besar* land newly brought under cultivation and irrigated from the *saran* or low-lying ground of an adjacent tank. Manured with 15 cart-loads of farmyard manure per acre before sowing. Actual yield much below the formulæ, attributed to deficient watering, which also affected the quality of the grain. The proportion of straw unusually high. Area of seed-bed not known.
Do. ...	32 4/5 Do.	Do. ...	*Experiment No. 5*:—*Sutarsál* rice on a similar land with equal facilities for irrigation. Manured as above. Yield below that of the formulæ but not so low as in the previous test.
Do. ...	51 1/2	...	*Experiment No. 6*:—*Gorádu* soil manured with 10 cart-loads of cowdung per acre and apparently growing only one crop. Rotation undefined but for the las three years the crops were:—(1) bávto, (2) juvár, and (3) castor. Cultivation bad. Crop below average of the táluka. Test vitiated by weighing crop when wet. Incidence high. Value of chaff and also of subordinate pulse included in column 9.
Do. ...	43	...	*Experiment No. 7*:—Similar soil but not manured. Crops during last three years were:—(1) *kodra*, (2) *juvár*, and (3) *bájri*. Cultivation good, but crop below average. Figures untrustworthy owing to the cause stated above. By-products valued, though not weighed. Value of subordinate grains included in column 9.
Do. ...	51 1/2	...	*Experiment No. 8*:—*Besar* soil on which *juvár* grown continuously for the last five years without any manure. Land much exhausted. Cultivation good, but season not favourable. Incidence high, value of by-product and sprinklings entered in column 9. Figures not accurate for reason stated under test No. 6.
Do. ...	43	...	*Experiment No. 9*:—*Besar* soil growing *bávto*, *kodra* and *bájri* in rotation. Manured with 5 cart-loads of street sweepings in May before sowing. Value of sprinklings (Rs. 5-7-6) included in column 9. Crop up to the average of neighbouring fields; figures here also vitiated by the crop being weighed wet.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Ta'luka, Village and experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KAIRA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. H. R. Cooke, Collector—continued.										
10	Mátar (Kathváda) ...	Rice (Jini), 22nd November 1891.	8	1,125	19½	1,427 in husk.	...	43 8 2	8 3 9 O. S.	18·92	0 4
11	Mátar (Navágám)... ...	Do. ...	16	2,250	18	2,774 Do.	...	83 10 7	10 5 0 O. S.	12·32	0 4
12	Mátar (Navágám)	Rice (Sutarsál), 23rd November 1891.	7	985	8⅕	1,562 in husk.	...	40 7 8	6 3 2 O. S.	15·31	0 4
13	Mátar (Náyka)	Do. (Kamod), 24th November 1891.	16	2,250	14	2,694 Do.	...	93 9 8	8 12 10 O. S.	9·40	0 4
	PANCH MAHA'LS.										
	Mr. E. Maconochie, Assistant Collector.										
14	Godhra (Hansápur)... ...	Do. (Vánkla), 7th November 1891.	8	640	20½	810 Do.	700	18 12 0	0 14 6 O. S.	4·83	0 4
	Mr. Pránlál Harkisandás, District Deputy Collector.										
15	Dohad (Kharedi)	Maize (makái, dholi), 15th October 1891; followed by a mixture of	12	900	12⅘	1,436	1,332	32 10 0	1 14 0 R. S.	5·75	0 10
16	Do.	Red Gram,		370	64	443	360	10 7 4			
		Barley ...	8	170	19⅓	111	124	2 11 4	Do. ... R. S.	13·68	0 10
		and Rape, 8th March 1892.		5	1¼	11	16	0 8 8			
								13 11 4			
	BROACH.										
	Mr. S. L. Batchelor, Assistant Collector.										
17	Jambusar (Khánpor) ...	Wheat (Potia?), 8th February 1892.	18	1,140	40	492	810	27 12 7	3 12 7 O. S.	13·62	0 8
18	Amod (Ghamnád)	Chickling Vetch, (Láng), 9th February 1892.	19	845	40	925	1,323	32 4 8	5 3 2 O. S.	16·09	0 8
19	Jambusar (Jambusar) ...	Juvár (Sorghum vulgare), 10th February 1892.	20	1,300	8	792	796	17 13 8	3 11 1 O. S.	20·68	0 10

Northern Division, 1891-92—continued.

R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-Product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwt.	
Weight ser =40	33⅜ in husk.	...	*Experiment No. 10*:—*Besar kiári* land, manured with 15 cart-loads of cowdung before sowing, growing continuous rice without any second crop. Field irrigated thrice from the Khári river by means of a water-lift. Cultivation good, but the season being very late, crop did not get sufficient water at the last irrigation. By-products valued though not weighed. Grain weighed wet, but figures corrected according to dryage reported.
Do. ...	Do. ...	...	*Experiment No. 11*:—Similar soil and manured in the same way. Irrigated twice from the Khári, and once from a well. Rotation irregular:—(1) barley and rice, (2) rice, (3) and (4) barley, and (5) rice and wheat. Seed sown in July and transplanted in September. Area of seed-bed not ascertained. Figures of outturn and by-products as in last experiment.
Do. ...	39¾ in husk.	...	*Experiment No. 12.—Besar* soil irrigated from the Khári river and manured with 2½ carts of cattls dung. Rotation:—(1) rice, wheat and barley, (2) rice and wheat, (3) fallow, (4) and (5) rice. Seed-rate compared with the formulæ, less than half. Crop half the average of the táluka, but yield much higher than that given in formulæ for a seven-anna crop. By-product not weighed, but valued. Figures corrected according to dryage reported.
Do. ...	29⅛ Do.	...	*Experiment No. 13.—Besar* soil irrigated from the Khári and by means of a tank filled by the same river and manured with 5½ cart-loads of cattle dung. Rotation:—rice and wheat every year, except 1888-89, when rice alone was grown. Cultivation good. Season as above. By-product valued. Figures corrected.
Do. ...	45⅐ Do.	5	*Experiment No. 14.*—Inferior rice *vánkla*, on mixed black *bhuri* unirrigated land growing rice continuously for the last four years. Manured with about 15 cart-loads of cow and goat dung per acre applied before rains commenced. Seed-rate low for rice not transplanted. Season unfavourable and no weeding done.
Do. ...	46⅔	6	*Experiment Nos. 15 and 16.*—These tests are on twice cropped *gorádu* or light brown dry-crop land growing maize followed by gram and rape as a second crop during the two previous years. No manure was applied this year. Rain was sufficient for maize, the first crop; the second crop is said to have suffered from want of moisture. Seed-rate of kharif crop low and of rabi crop high.
Do. ...	46⅔	3 3/14	
	46⅔	3 3/14	
	20½	...	
Do. ...	20½	1 9/10	*Experiment No. 17.*—Wheat, *potia* (?), on a black cotton soil, growing in rotation wheat and cotton. The land is manured only once in six years with about 10 carts of cattle dung per acre, the last time 3 years since. Season favourable and cultivation careful; field free from weeds. Crop estimated at 18 annas, but yield less than half that of the formulæ. Seed-rate compared with the formulæ (60 lbs) low.
Do. ..	36½	1⅝	*Experiment No. 18.*—Rich black cotton soil growing in rotation:—(1) cotton and (2) either *juvár* or *láng*. No manure used. The field low-lying, a suitable condition for *láng*. Season very favourable. Incidence rather high, but the burden of assessment must apparently lie rather on cotton, the principal crop, than on one grown for rotation.
Do. ...	54⅔	2 7/10	*Experiment No. 19.—Juvár* on a dry-crop unmanured black soil growing *juvár* and cotton in alternate years. Season favourable and cultivation careful. Crop estimated at 20 annas, but actual yield low. Seed-rate about average for Broach. Incidence very high, but the remarks made above apply here also.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
			Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	BROACH—*continued.* *Mr. Phirozshah Pestanji, District Deputy Collector.*										
20	Vágra (Ráhád)	Chickling Vetch, (Lang), 22nd February 1892.	12	400	41	1,055	1,520	28 7 0	4 13 4 O. S.	16·99	0 16
21	Do.	Wheat (Katha), 28th February 1892.	12	675	61½	849	1,130	36 11 6	4 13 4 O. S.	13·16	0 16
22	Vágra (Wahiál)	Cotton, 12th March to 8th April 1892, 3 pickings.	14	310	7¼	502 seed. cotton.	...	29 1 1	2 9 5 O. S.	8·90	0 8
	SURAT. *Mr. Anna Gopál Kotwál, District Deputy Collector.*										
23	Bárdoli (Pera)	Castor seed (Diveli), 2nd March 1892.	12	340	45½	458 seed.	...	20 11 4	7 12 8 O. S.	37·59	0 4
24	Do. (Tarbhán)	Do. 16th March 1892.	12	340	33⅓	488 Do.	...	22 0 9	3 4 4 O. S.	14·81	0 4
	Mr. Dárásha Dosábhái, District Deputy Collector.										
25	Bulsár (Wásiar)	Do. 29th February 1892.	10	280	41½	427 Do.	....	19 11 0	1 13 8 O. S	9·41	0 8
	THA'NA. *Mr. Mirza Abbás Ali Baig, Assistant Collector.*										
26	Kalyán (Wádavli) ... ... "	Rice (Dodka) 6th November 1891; followed by	10	775	61	988 in husk.	1,920 straw; 333 chaff.	32 9 8	5 2 5 O. S.	15·79	0 6
27	Do.	Large fruited Dolichos, (Vál) 9th March 1892.	11	230	43	359	164	11 14 6	5 2 5 O. S.	43·26	0 6

Northern Division, 1891-92—concluded.

R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
Weight ser = 40	$62\frac{1}{5}$	$1\frac{1}{5}$	*Experiment No. 20* :—Chickling vetch or *láng* sown on good black soil of fair depth, growing usully wheat or *láng* or both followed by cotton in the second year. During the three previous years the rotation was :—(1) *láng* and wheat, (2) cotton and (3) fallow. The last not customary except on large holdings. The field is never manured. Rain-fall exceptionally heavy for the early, but favourable to rabi crops ; the field under test low-lying and retentive of moisture. Tillage good. Crop estimated at only 12 annas, but actual yield more than bumper due partly to good season and partly to the land having been originally prepared for cotton which was sown but destroyed by the heavy rain-fall in July-August.
Do. ...	$28\frac{1}{2}$	$1\frac{1}{2}$	*Experiment No 21* :—Dry-crop *Kátha* wheat on another part of the same field cultivated by a *Bohora* tenant. (1) *Lang*, (2) cotton and (3) wheat were grown during the three previous years. The land received no manure this season, but had a top-dressing of about 8 carts of farm-refuse in the previous year. Season good. Cultivation very careful. Land prepared for cotton, which, however, was not sown owing to heavy showers of July-August.
Do. ...	$17\frac{1}{3}$ seed cotton.	...	*Experiment No. 22.*—Cotton on a moderately good black (*duyam káli*) soil, growing *láng* or wheat, or both, alternating with cotton. Heavy rain destroyed the first sowing. Crop re-sown in August and did very well. The field lies a considerable distance from village and never gets manure. Cultivation very careful.
Do. 37	$22\frac{1}{7}$ castor seed.	...	*Experiment No. 23.*—Castor seed taken as a second crop on a rich black *marcho* soil, manured with about 48 carts of cowdung per acre applied before rice, the first crop, was sown. Rotation undefined but for the three previous years the crops were :—(1) *vál*, (2) rice and *vál*, and (3) rice and castor. Field ploughed thrice before castor was put in. Early rains heavy, but scanty towards the close, being deficient both for rice and castor. Incidence very high, but calculated on the second crop alone. Seed-rate high, but the formulæ seed-rate is much too low.
Do. ...	Do.	...	*Experiment No. 24.*—Black *richania* soil similarly manured. Rotation :—(1) rice, (2) and (3) rice and *vál*. Field ploughed four times after rice, the first crop, was harvested. Season as above. Cultivation good. Yield higher than in the above test with a lower seed-rate. Incidence on the second crop only.
Do. ...	$21\frac{2}{3}$ Do.	...	*Experiment No. 25.*—Dry-crop black soil growing castor every year without manure. Season not very favourable, but tillage good. Moisture conserved by erection of earth-bunds around the field. Seed-rate rather high.
49	40 in husk.	$3\frac{3}{7}$ straw ; 1 chaff.	*Experiment Nos. 26 and 27.*—First class dark brown *garvi* land growing rice every year followed by *vál* as a second crop. Seed-bed manured with 192 lbs. of dry cowdung per guntha. Tillage good, but season unfavourable. Rains came late and ended early. September-October rain which is very important for *dodki* rice failed. The grain did not fill well. Area of seed-bed required for an acre of plantation estimated at $5\frac{1}{2}$ gunthas. *Vál* unmanured gave a satisfactory outturn, moisture left in soil being about sufficient. Fodder useful but not valued. Incidence of assessment on both crops 11·57 per cent.
84	$30\frac{1}{3}$	...	

LIBRARY OF THE ROYAL BOMBAY BRANCH OF THE SOCIETY.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KHA'NDESH. *Mr. K. R. Bamanji, Assistant Collector.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
28	Sindkheda (Betáwad) ..	Linseed (Alsi), 2nd February 1892.	...	...	17	606 Seed.	394 chaff; 344 boori.	28 1 3	1 1 10 O. S.	3·96	0 10
29	Do. do. ... *Mr. J. C. Gloster, Assistant Collector.*	Do. 3rd February 1892.	12	250	11⅓	384 Do.	244 chaff; 225 boori.	17 14 6	2 2 6 O. S.	12·06	0 10
30	Bhusával (Edlabad) ... **NA'SIK.** *Mr. L. G. Deshmukh, Assistant Collector.*	Do. 11th February 1892.	16	400	15	570 Do.	435 chaff; 370 straw.	27 8 0	1 4 10 R. S.	4·73	0 8
31	Málegaon (Nilgawhán) ... *Mr. H. W. Hayward, Assistant Collector.*	Sesamum (Káthali til), 21st October 1891.	16	560	1⅝	438 Do.	1,315	30 7 6	0 15 5 O. S.	3·16	0 8
32	Igatpuri (Wádiware) ...	Niger seed, (Khurásni) 16th November 1891.	16	400	3	279 Do.	880	10 5 0	0 6 0 R. S.	3·63	0 8
33	Igatpuri (Igatpuri) ...	Do. 21st November 1891.	16	400	9	264 Do.	895	9 11 0	0 6 0 R. S.	3·87	0 8
34	Niphád (Niphád) ... ... **AHMADNAGAR.** *Mr. Sorábji Padamji, Assistant Collector.*	Linseed (Alsi), 4th February 1892.	16	400	9	251 Do.	450	13 10 4	2 3 1 R. S.	16·06	0 8
35	Kopargáon (Kopargáon) ...	Gram; ...	4	40	12	66½	128 chaff; 56 stalks.	3 10 8	0 6 1 R. S.	5·90	0 10
		with rows of jowári;		10	...	...	336 kadbi.	2 0 0			
		and safflower mixed, 9th January 1892.		5	...	30½	12 chaff; 12 stalks.	0 12 5			
								6 7 1			
36	Akola ... ... *Mr. R. B. Stewart, Assistant Collector.*	Wheat (Kátha) and safflower mixed, 7th February 1892.	12	350	30½	1,956	3,255	87 12 5	1 10 11½ R. S.	1·55	0 8
				50	4½	969	385	20 10 0			
								108 6 5			
37	Nevása (Pravara Sangam) .	Wheat (Desoli) and safflower (Kardai), 8th February 1892.	12	450	36	195	3⅝ bundles.	7 14 6	1 0 5 R. S.	11·96	0 8
			16	60	4	22	...	0 10 9			
								8 9 3			

Central Division, 1891-92.

R. S.=Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
125	22⅘ Seed.	4⅔	*Experiment No. 28.*—Linseed on medium black soil. The following sequence of crops was grown during the last three years:—(1) *jowári*, (2) cotton and castor, (3) *bájri* and kidney-bean. Crop unmanured. Season fair. Cultivation good. Anna estimate not given. Crop a full average one. Seed sown about 6 lbs. more than average rate of district. Sample weighed 124 tolas in this office.
125	22⅘ Do.	4⅔	*Experiment No. 29.*—Same crop on an *aval káli* or rich black soil without manure. The last three years' cropping was:—(1) *jowári* and *tur*, (2) linseed, *jowári* and *tur*, and (3) wheat and gram. Cultivation fair. The crop always a delicate one, more affected by an irregular season, on this heavy land than on the light soil of the previous test. Seed-rate, 11 lbs. per acre, average. The formulæ seed-rate, 6 lbs. per acre, is evidently wrong. Sample same weight as above.
126½	23 1/16 Do.	2⅔ chaff; 3⅘ straw.	*Experiment No. 30.*—Linseed on reddish brown sloping unmanured land usually growing kharif crop only. Field usually grows cotton and *jowári* in alternate years. Cultivation indifferent, but rain favourable for rabi crops generally. No kharif crop raised this year. Yield under-estimated. Sample ser weighed 125 tolas.
114	14⅘ Do.	...	*Experiment No. 31.*—*Káthálí til* grown on an ordinary black soil without manure. The land was unsown for two years before which *bájri* was taken. Cultivation good, and season favourable. Seed-rate average. Outturn low. Seed 1⅘ lbs. per acre. (The formulæ seed-rate, 6 lbs. per acre, is absurd).
88	27 Do.	...	*Experiment No. 32.*—Stony light *mál* land growing without manure niger-seed and *nágli*, alternately. Field lay fallow last year. Season more favourable to niger than for other crops. Seed-rate low. Crop estimated at 16 annas for this class of land. By-product useful as fodder and for rab, but not valued.
89	27⅓ Do.	...	*Experiment No. 33.*—Same crop on a similar soil. Field fallow for the last three years. Seed-rate treble that in the above test, but yield slightly below it. By-product not valued.
95⅘	18½ Do.	...	*Experiment No. 34.*—Linseed on a medium black soil grown without manure or irrigation. Rotation undefined, but recently *bájri* has alternated with linseed. Season fair. Yield over-estimated at 16 annas. Incidence rather high, not accounted for by the experimenter.
108	25⅓	1 9/14	*Experiment No. 35.*—Gram, principal crop, *jowári* and *kardai* subordinate crops on poor *barad* land with murum underlying a thin upper layer of black soil. Crop practically a failure owing to deficient rainfall.
...	...	1½	
85	41⅔	5½	
109	25	5⅔	*Experiment No. 36.*—Wheat, *kátha*, and safflower mixed on an unirrigated black soil manured with 10 carts per acre of household sweepings and rubbish, applied before commencement of the rains. Rotation:—(1) *bájri*, (2) *udid* or black gram, and (3) *bájri*. A field of 4 acres and 30 gunthas was sown with 52 sers of wheat and 8 sers of safflower mixed together. Want of sufficient moisture is said to have slightly affected the quality of wheat, but the quantity realized is more than five-fold that given in the formulæ for a 12-anna crop, leaving out of consideration the yield of *kardai* which was not ripe at the time of experiment and was tested afterwards by the Mámlatdár. Tillage very careful.
90	48½	5½	
116	26¾	6 bundles.	*Experiment No. 37.*—Wheat and safflower sown mixed with a two-coulter drill on an unirrigated and unmanured black soil. Rotation:—(1) cotton and wheat, (2) *bájri*, *tur* and gram. Rainfall short, but tillage careful. Wheat estimated at 12 annas and *kardai* at 16 by the experimenter. These estimates are evidently too high; the average of the táluka was about 9 annas, and they conflict also with the formulæ.
88	33⅓	...	

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	AHMADNAGAR—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. R. B. Stewart, Assistant Collector—contd.										
38	Nevása (Pravara Sangam)...	Gram and safflower (kardai), 8th February 1892.	16	460	32	475	1¼ bundles, ...	15 0 1	1 2 0 R. S.	7·49	0 8
			11	35	4	7½		0 3 5			
								15 3 6			
	Mr. V. B. Vádekar, District Deputy Collector.										
39	Karjat (Karjat)	Jowári (guldháv),	11	360	4	291	500 kadbi; 70 chaff.	15 2 6	0 4 6 R. S.	1·60	0 4
		and safflower (kardai), 1st February 1892.	11	40	1	98	110 chaff.	2 5 6			
								17 8 0			
40	Karjat (Kuldharan) ...	Jowári (shrikhandi).	11	360	4	415	250 kadbi; 80 chaff.	15 13 4	0 3 11 R. S.	1·36	0 4
		and safflower (kardai), 14th February 1892.	8	25	1	87	100 chaff.	2 2 2			
	POONA.							17 15 6			
	Mr. C. P. B. Wiltshire, Assistant Collector.										
41	Mával (Náné)	Wheat (Potia), 6th February 1892.	14	540	65	188	158 straw; 13¼ bran.	9 8 6	1 5 2 R. S.	13·88	0 8
42	Do do.	Do. ...	16	640	92	206	136 straw; 144 bran.	9 9 9	1 3 9 R. S.	12·84	0 8
43	Khed (Chákan)	Potatoes, 18th February 1892.	6	2,300	547	2,317	...	84 12 3	1 3 4 R. S.	1·42	0 4
	Mr. W. T. Morison, Assistant Collector.										
44	Indápur (Shelgáon) ...	Ground-nut (Bhuimug), 16th February 1892.	16	3,200	14	415 in sheli.	90	15 2 6	0 3 0 O. S.	1·23	0 8
45	Indápur (Indápur)	Wheat (Kapli or Jod), 21st February 1892.	16	1,440	109	1,971 in husk.	1,930	85 0 10	1 0 10 R. S.	1·23	0 4
	Mr. J. Mollison, Superintendent of Farms.										
46	Haveli (Bopodi)	Sugar-cane (Pundia), 30th and 31st March 1892.	13	3,720	About 16,000 to 20,000 sets.	7,280 gul.	8,640 fresh tops.	495 5 0	1 6 6 R. S.	0·28	0 4
47	Do. do.	Sugar-cane (Pundia), 19th April 1892.	12	3,000	14,996 sets = 6,516 lbs.	6,740 gul.	8,530 fresh tops.	388 9 2	2 10 4 R. S.	0·68	0 4

Central Division, 1891-92—continued.

R. S.=Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
114	32⅛	5⅛ bundles.	*Experiment No. 38.*—Similar soil with a mixture of gram and *kardai*. Crops grown during the two previous years were :—(1) wheat, gram and *jowári*, (2) *bájri* and *tur*. Season and tillage as above.
88	33¾	...	
108	33¼	5/7	*Experiment No. 39.*—Brown *barad* land growing without manure or irrigation *jowári* and *kardai* mixed, every two years, followed by one year of *jowári* singly. Two rows of *kardai* were put in after six rows of *jowári*, the former covering only a sixth of the space taken up by the latter. Tillage good, but land rather sloping and not retentive of moisture. Season generally below average and crop indifferent. Land free from weeds.
85	44⅜	4⅛	
108	33¼	5/7	*Experiment No. 40.*—*Jowári* and *kardai* sown mixed on a black level land unmanured. Rotation :—(1) fallow for 3 years, (2) *jowári* alone, (3) *jowári* and *kardai* mixed. Season, &c., as above. Yield of grain higher, but that of *kadbi* lower than in above test.
85	44⅜	4⅛	
104⅘	20⅜	8½ straw; 4 bran.	*Experiment No. 41.*—Wheat, *potia*, on a blackish *malai* land growing wheat every year without manure or irrigation. No rain after sowing. Cultivation indifferent; anna estimate much too high. Actual yield not more than 6 annas. Sample weighed in this office 102 tolas.
107	22½	8½ straw; 4 bran.	*Experiment No. 42.*—Same crop on a *kálvat* unirrigated and unmanured land growing wheat every other year and remaining fallow in the interval. Season and tillage as above. Seed-rate high for dry-crop. Crop estimated at 16 annas, but yield not more than 7 annas. Sample ser 104 tolas.
76¼ weight ser.	27⅛	...	*Experiment No. 43.*—Potato on a red *murum* land manured with 10 carts of cowdung applied before sowing and irrigated from a well opened since settlement. Sets cut and planted in furrows made by ordinary *nángar* and covered by earth moved in forming next furrow. Rotation :—two years of *bájri* followed by a double crop of potatoes. Rain being scanty, season indifferent. Tillage good. Seed-rate under-estimated. Crop very poor. Incidence on the second crop alone and its lowness due to abnormally high price of potatoes.
78 weight ser.	31¼ in shell.	3/7	*Experiment No. 44.*—Light red *mál* land with hard gravel below at a depth of 8 inches, locally called *chickniche rán*, growing without manure *bájri* and *bhuimug* in alternate years. Season exceptionally bad owing to scanty rain, but crop watered eight times from the Nira canal at a charge of Rs. 4 per acre. Cultivation poor, field ploughed once only. Seed-rate very low, being only a fourth of that in the formulæ. Yield also low. Incidence not high, because of high market rates for produce.
63	24¼ in husk.	5	*Experiment No. 45.*—Wheat, *khapli* or *jod*, on an irrigated red soil growing annually maize followed by wheat. Manured with 22 cart-loads of cowdung per acre applied in September after reaping of the early crop. Rain scanty, but the crop under test watered regularly once a week for five months from a well built before settlement. Field just outside the town and well cared for. Yield bumper; seed-rate high; straw not useful as fodder, but sold for thatching at about 2 annas per 100 bundles. Incidence on the second crop alone.
78 weight ser.	15 gul.	...	*Experiment No. 46.*—*Pundia* or soft white Mauritius cane on a brown *murmát* land with rock at about 18 to 24 inches below the surface. Rotation :—*jowári* followed by sugarcane ratooned in the second year. Land heavily manured with town sweepings in March before the sets were planted and a top-dressing of castor-cake given in July before the formation of fresh beds. Tillage careful. Field ploughed twice before and twice after application of manure and weeded four times. Season good at first, but water in the Mutha canal, from which the crop was irrigated, ran short in February, and reduced the outturn to 13 annas. The ashes of leaves and crushed canes burnt in making *gul* are useful as manure and valued at Rs. 10 by the experimenter. Green tops fed to cattle working the mill and therefore not valued.
80 weight ser.	17½ Do.	5	*Experiment No. 47.*—Same crop on blacksoil in good heart on which groundnut was raised in the previous year, 40 carts of poudrette per acre were applied before planting. Tillage good and field clean. Water was scarce in the Mutha canal in May and June and the crop suffered in consequence. It had to be harvested a month too soon for this reason. Crop estimated at 12 annas. This estimate is in comparison with actual returns from similar land under the high cultivation practised near Poona. Two-thirds of the tops fed to bullocks working at the mill and not valued.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, Village, and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	SA'TA'RA. *Mr. G. D. Pánse, Assistant Collector.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
48	Válva (Ashta)	Ground-nut, 14th January 1892.	16	3,200	96	4,032 in shell.	10 bundles.	149 9 0	1 15 8 O. S.	1·01	0 10
	Mr. C. G. H. Faweett, Assistant Collector.										
49	Khánápur (Kadegáon) ...	Ground-nut, 27th January 1892.	16	3,200	95	1,907 Do.	3,460	72 1 4	5 4 2 R. S.	7·29	0 4
	Mr. T. D. Fry, Assistant Collector.										
50	Vái (Surul)	Ground-nut, January 1892.	8	900	30¾	345 Do.	1,784	17 14 8	6 1 3 O. S.	33·48	0 5
51	Jávli (Kusumbi)	Sugarcane (Pundia), 26th February 1892.	11	2,100	5,040 canes.	1,948 gul..	9,027	152 6 4	6 3 7 O. S.	4·08	0 4

Central Division, 1891-92—concluded.

R. S.=Revision Survey.

Equivalent in Toals of local measure Ser.	Prices or Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
Tolas.	Lbs.	Cwt.	
78 weight ser.	29 in shell.	1 bundle	*Experiment No. 48.*—Groundnut on a first class black soil irrigated eight times from a well recently constructed. Field grows sugarcane, groundnut, *jowári*, &c. 300 sheep were folded for three days and 10 carts of cowdung were applied before sowing. Season fair and cultivation good, seed-rate compared with the formulæ, high; yield also high, rising to bumper standard.
43¼	33⅓ Do.	2	*Experiment No. 49.*—Black soil of medium quality growing in rotation:—(1) *jowári*, (2) *bájri* and (3) *bhuimug*. 20 sheep were at first penned for four days and then eight carts of cowdung, ashes and village refuse were spread upon the 13¾ gunthas on which the crop was raised. Season unfavourable, rainfall being much below the average. The crop, however, watered towards the end, twice from a *pát* fed by a *dharan*. Seed-rate high, but yield below the formulæ standard. Sample ser received in this office weighed 39 tolas only.
41	26⅔ Do.	3	*Experiment No. 50.*—*Bhuimug* on a rich brown *shádu* soil manured with 800 sheep folded for five or six days a fortnight before sowing. Rotation undefined but the crops for the past three years were:—(1) *bhuimug*, (2) *bájri* and (3) *rála*. Season bad owing to scanty rain. Yield very poor though crop watered from a well. Seed half the formulæ rate. Sample ser weighed 39 tolas in this office. Anna estimate too high.
26 weight ser.	13⅓ gul.	13	*Experiment No. 51.*—Fairly rich reddish soil growing rice for three years followed by two years of sugarcane. Field manured with 100 baskets of cowdung per acre. The crop irrigated by a *dharan* from a *nála* twice a month. Season bad, rain having fallen in the months of July and August only. Tillage good.

Summary of Crop Experiment Reports,

O. S. = Original Survey ;

No.	District, Ta'luka Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.			Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	Area of Test.
					Seed.	Yield of.					
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	BELGAUM. *Mr. J. H. DuBoulay, Assistant Collector.*		Annas	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
52	Khánápur (Bidi)	Rice (Dodd Bhatta), 17th November 1891.	11	775	92⅓	2,677 in husk.	...	85 8 4	5 1 0 R. S.	5·92	0 4
53	Do. do.	Do. ...	11	775	92⅓	2,169 Do.	...	70 2 6	5 7 3 R. S.	7·77	0 4
54	Do. do.	Do. (Mugud Bhatta) 17th November 1891.	13	1,180	92⅓	3,025 Do.	....	94 2 8	5 9 3 R. S.	5·91	0 8
	BIJA'PUR. *Mr. W. C. Rand, Assistant Collector.*										
55	Bágevádi (Bágevádi) ...	Spelt wheat (Jave Godhi), 29th February 1892.	20	1,800	95	1,168 husked.	...	56 13 2	1 6 10 R. S.	2·51	0 4
56	Do. do.	Do. ... 1st March 1892.	20	1,800	210	1,137 Do.	....	55 5 0	2 6 11 R. S.	4·39	0 4
	Mr. J. M. Cursetji, District Deputy Collector.										
57	Hungund (Hungund) ...	Do. ...	14	1,210	104½	1,381 in husk =1,084 husked.	1,161	73 5 8	1 5 6 R. S.	1·83	0 10
	DHA'RWA'R. *Mr. R. E. Enthoven, Assistant Collector.*										
58	Kod (Hirekerur)	Sugarcane (RasdáliKhabbu), 21st and 22nd March 1892.	18	5,400	3,000 sets.	3,590 gul.	Crushed canes 12,960 lbs. Green tops gave 20,000 sets for replanting and 2,270 bundles dry blades = 6,240 lbs.	236 14 0	7 8 0 R. S.	3·16	0 4
	Mr. C. C. Boyd, Assistant Collector.										
59	Bankápur (Shiggáon) ...	Italian Millet (Navani), 9th December 1891.	12	350	8½	422	1,845 Kadbi 105 Chaff.	12 11 3	1 6 10 R. S.	11·23	0 8
	KOLA'BA. *Mr. J. P. Orr, Assistant Collector.*										
60	Roha (Roth Khurd) ...	Sweet rice (Támbad Halva), 23rd October 1891.	20	3,000	56½	2,403 in husk.	1,915	55 15 10	6 4 7 O. S.	11·23	0 8

Southern Division, 1891-92.

R. S. = Revision Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
60	34⅜ in husk.	...	*Experiment No. 52.*—Unirrigated rice, *dodd bhatta*, on a reddish soil, locally called *masâri*, growing rice followed by large fruited dolichos every year, the latter being replaced by field pea occasionally. Manured with six cart-loads of a mixture of cowdung and green grass immediately after sowing. Cultivation indifferent, and season below average. Value of by-product included in column 9, though not weighed. Compared with the formulæ, outturn very high. No second crop raised this year owing to failure of rain. Sample ser weighed 57 tolas.
60	34⅜ Do.	...	*Experiment No. 53.*— Do. do. do. Manured with 8½ carts of cowdung and green grass, &c., &c. Sample ser weighed 56 tolas in this office.
60½	34⅜ Do.	...	*Experiment No. 54.*—Same crop on a similar soil watered during the rains by an occasional overflow from a neighbouring tank. Manured with a mixture of 10 cart-loads of green grass and cowdung said to have been applied immediately after sowing. Rotation same as above, but on the plot tested rice alone was raised during the past three years. Season as above, but cultivation more careful. Yield more than 2½ times that of the formulæ for a 13-anna crop. By-product valued higher than usual owing to scarcity. Sample ser weighed 58 tolas in this office.
143½	20½ husked.	...	*Experiment No. 55.*—Wheat, *khapli* or *jave godhi*, on a reddish black *maddi* land irrigated from a well with ample water. The land classed as *bâgâyat*, but usually growing dry-crop *jowâri*, kharif or rabi, according to the nature of the season. Manured by sheep folding, but their number or period of folding could not be ascertained. Season favourable for an irrigated crop. Cultivation good. Seed-rate ordinary, but higher than formulæ. Yield rather low. Prices high, and incidence consequently low.
140⅜	20½ Do.	...	*Experiment No. 56.*—Same crop on a greyish soil, *mardi*, growing (1) chillies and (2) late *jowâri*. Manured with 30 cart-loads of cowdung per acre in April and irrigated from a well. Season as above. Tillage careful. Seed-rate high. Figures doubtful.
51 in husk 81 husked.	16⅜ Do.	1⅛	*Experiment No. 57.*—Black soil irrigated by a *mot* from a large well and manured with about 13 cart-loads per acre of cowdung, ashes, straw and other village refuse applied immediately before the wheat was sown. The plot tested grows wheat always. The other portion of the field had various crops in rotation. Season good for irrigated crops. Cultivation indifferent. Price of wheat much higher than in the above tests. Sample weighed in this office 83½ tolas.
20 weight ser.	17⅞ gul.	Crushed canes 23; green top 8¾; dry blades 3¾	*Experiment No. 58.*—Sugarcane, *rasdâli khabbu*, on average black soil irrigated from the Hirekerur tank and growing rice for two years followed by sugarcane. Manured with 5 cart-loads of cowdung per acre applied in February and sheep folded for two days. Rainfall which came late, was on the whole favourable in the *mallâd*. Tillage fair. Value of by-product (Rs. 26-14-0) included in column 9. Yield below formulæ.
132	45½	5	*Experiment No. 59.*—*Navani* or Italian millet on red *masâri* land manured every year in June before sowing with 2½ cart-loads of cattle dung and fodder refuse. Rotation:—*jowâri* alternating with *navani*. Season not unfavourable, for *navani* which did not suffer to the same extent as other crops. Value of by-product rather high owing to demand for cattle imported from famine tracts. Seed-rate double that of the formulæ. Yield high.
54	48 in husk.	2⅞	*Experiment No. 60.*—Sweet rice, *tâmbad halva*, on good soft *khalâti* soil, one foot deep, growing rice every year. Field swamped by the overflowing of a river for a few days just after transplantation and rain water passed through the field from and to others in the neighbourhood. Season very favourable and cultivation good. A two-guntha seed-bed raked and sown in June, gave seedlings for the whole field (17½ gunthas).

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of Test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KOLA'BA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. J. P. Orr, Assistant Collector—continued.										
61	Roha (Roth Khurd) ...	Sweet Rice (Dodka Halva), 24th October 1891.	20	3,000	44	1,953 in husk.	1,926	45 0 0	4 14 7 O. S.	10·91	0 8
62	Do. do. ...	Do. (Támbad Halva), 26th October 1891.	20	3,000	59⅓	1,916 Do.	1,816	45 15 10	0 4 0 O. S.	0·54	0 8
	Mr. K. N. Bhángáonkar, District Deputy Collector.										
63	Alibág (Náde)	Do. (White Halva), 5th November 1891.	20	2,500	31⅓	2,547 Do.	2,943	69 1 10	5 11 2 O. S.	8·24	0 4
	RATNA'GIRI.										
	Mr. A. M. T. Jackson, Assistant Collector.										
64	Rájápur (Lánje)	Nágli (Khandála Eleusine coracana) and Vari (Dhamni) Panicum maliaceum sown mixed, 9th November.	10	500	22½	542	637	13 9 11	0 3 4 O. S.	1·41	0 8
			10	...	Ser. ⅝	60 Sers.	...	1 1 11			
								14 11 10			
65	Ratnágiri (Náchane) ...	Nágli (Mutle), 23rd October 1891.	12	800	3	1,348	2,092	39 6 11	0 4 4 O. S.	0·68	0 17
	Mr. L. N. Ajgáonkar, District Deputy Collector.										
66	Sangameshvar (Wándri) ...	Nágli (Mahádi), 6th November 1891.	13	1,060	5⅓	427	920	10 12 0	0 3 9 O. S.	2·1	0 5
67	Do. do. ...	Do. ...	13	1,060	5⅓	845	1,344	21 2 10	0 4 1 O. S.	1·20	0 5
68	Sangameshvar (Ojharkhol) .	Do. 9th November 1891.	12	1,000	12	867	1,660	21 13 0	0 3 6 O. S.	1·00	0 10
69	Do. (Arawli) ...	Harik (Rámesari) Paspalum scrobiculatum, 16th November 1891.	14	670	12	834	2,000	11 7 9	0 5 0 O. S.	2·72	0 8
70	Chiplún (Khershet) ...	Do. (Bárik), 17th November 1891.	12	500	12	487	1,800	6 15 0	0 3 1 O. S.	2·77	0 10
	KA'NARA.										
	Mr. C. W. Hudson, Assistant Collector.										
71	Honávar (Mánkidurg) ...	Green Gram (Hesáru), 8th March 1892.	10	220	39	450	690	12 1 4	6 7 3 O. S.	53·4	0 4
72	Do.	Sugarcane (Dás-khabbu), 9th March 1892.	14	4,020 gul.	15,000 sets.	9,283 liquid jágri.	8,520 Fresh tops; 21,375 number of seed-tops.	377 15 6	4 4 8 O. S.	1·13	0 2⅔

Southern Division, 1891-92—concluded.

R. S.=Revenue Survey.

Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Grain.	By-Product.	Remarks.
13	14	15	16
Tolas.	Lbs.	Cwts.	
54½	48 in husk	3⅜	*Experiment No. 61* :—*Dodka halva* rice on similar but rather shallow rice land with *murum* within 8 inches. Field entirely dependent on rain water, and flow from neighbouring fields scarce. Season and tillage as above. A 3¾-guntha seed-bed supplied plants for 35 gunthas. Yield of grain below that in the above test, and also below the formulæ, due to inferiority of soil.
53	47 Do.	3	*Experiment No. 62* :—Sweet *támbad halva* rice on hard but deep and rather gritty soil lately converted from *varkas* and growing rice during the past two seasons. Sheep folded on the field for a day and night and plants transferred from a rábed seed-bed. Season favourable and tillage good. Yield slightly below that in the above tests, but improving year by year.
55⅜	42⅕ Do.	3	*Experiment No. 63* :—Sweet *halva* rice on a *nimgarvi* land growing rice alone every year and manured with 7 cart-loads of cowdung per acre in April-May before sowing. Seed-rate compared with the formulæ very low. Season favourable and tillage good. Sample received in this office gave only 53⅜ tolas per ser against 55⅜ recorded by the experimenter.
33½	41¼	12	*Experiment No. 64* :—*Nágli* with a slight sprinkling of *vari* sown broadcast on *bharad varkas* land. Soil consists of decomposed laterite. Field grows *nágli* and *harik* or rice after lying waste five years. Manured with 33 maunds goat manure and 17 maunds cowdung per acre. Season indifferent. Tillage fair. Seed-rate high. *Vari* measured, not weighed.
...	54 Sers.	...	
43 1/32	35⅓	15	*Experiment No. 65*.—*Nágli* alone on similar land growing sesamum after *nágli* after five years' fallow. Seed sown in a rábed seed-bed and planted out a month and half later with a piece of fish at the root of each seedling. Area of seed-bed for an acre of plantation 8 1/45 gunthas. Season favourable and tillage good. Seed rate low but yield excellent.
52	42⅔	11	*Experiment No. 66* :—*Nágli* (*Mahádi*) on steep *varkas* land growing (1) *nágli*, (2) *harik* and (3) *vari* in succession after 7 years' fallow. Manured with 8 head-loads of *bhusa* of dried fish at the time of planting in July. 5⅓ lbs. seed sown in 7 gunthas furnished seedlings sufficient for an acre. Season favourable, but yield low owing to bad cultivation.
51	42½	12	*Experiment No. 67* :—Same crop on even but stony soil with similar rotation after three years' fallow. A piece of dried fish (in all 10 maunds per acre) put in with each seedling at the time of planting. Tillage fair and season good.
52	43	10	*Experiment No. 68* :—Same crop on steep *varkas* land waste for 35 years. Brushwood (*kaval*) cut, spread and burnt as ráb, and seed sown broadcast a month before the monsoon set in. Season good and field well cared for.
48	79	19	*Experiment No. 69* :—*Harik* (*Rámesari*) 2nd crop in the usual rotation after 5 or 6 years' fallow on sloping unmanured land. Crop suffered slightly for want of rain, but cultivation good.
48	79	21	*Experiment No. 70* :—Same crop (*bárik harik*) on an upland, even but stony soil. A second crop after 5 years' fallow. Crop well taken care of but damaged by growth of a poisonous herb locally called *agya*. Yield consequently low.
101¼	43	5	*Experiment No. 71* :—Green gram, *hesáru*, on unirrigated sandy rice land, manured with 40 head-loads of cowdung and dry leaves burnt and spread over the land after the reaping of the early rice. Rotation, 2 rice crops each year with substitution of pulse for the 2nd crop of rice in the third year. Season fair, but cultivation bad. Incidence calculated on the 2nd crop alone.
...	26⅝ liquid jágri.	...	*Experiment No. 72* :—Sugarcane on rice land, locally called *kempu mannu gadde*, growing rice followed by sweet potatoes for years and then sugarcane for two years. Field irrigated from an adjoining *nála*. Dry leaves from previous crop and crushed cane burnt in March; 2½ months later a top-dressing given consisting of 15 head-loads of cowdung and dry leaves and 10 head-loads of rubbish mixed with earth and burnt. Season favourable and tillage good. Value of seed-tops (Rs. 85-7-6) included in column 9, but that of fresh tops used as fodder not calculated.

APPENDIX.

Details of the cost of cultivation of sugarcane crop on the Government Farm at Kirkee, referred to in Mr. J. Mollison's experiment (No. 47) on page 14.

Date.	Description of Work (Area 10 Gunthas).	Men.	Women.	Cattle.	Cost. Rs.	a.	p.
30th January 1891	Ploughing 1st, finished	1¾	...	5	1	3	0
26th February „	Do. 2nd, do.	1	...	3	0	11	3
7th-10th „ „	Digging head land	2½	...	...	0	9	4
24th March „	Ploughing 3rd...	1½	...	5	1	2	1
9th April „	Harrowing	½	...	¾	0	3	8
12th „ „	Spreading poudrette	2	9	...	1	9	6
.....	Cost of 10 loads poudrette	...	...	...	31	10	8
15th April 1891	Levelling and making ridges ...	1	...	4	0	13	9
16th-17th „ „	Breaking clods and making beds ...	8½	...	...	1	15	10
25th „ „	Watering and planting	3	4	...	1	3	3
27th „ „	Watering from the canal	½	...	...	0	1	10
.....	Cost of 3,499 sets (1,148 canes = 1,629 lbs.) at Rs. 2 per 1,000 sets	...	...	...	7	0	0
1st-28th May 1891	Watering from the canal	2	...	...	0	7	6
23rd „ „	Hand weeding 1st	...	10	...	1	4	0
7th-28th June „	Do. 2nd	...	12	...	1	8	0
9th-16th „ „	Watering from the canal	1	...	...	0	3	9
8th July „	Do.	½	...	...	0	1	10
16th „ „	Hand weeding	...	5	...	0	10	0
24th August „	Do.	...	11	...	1	6	0
25th „ „	Watering from the canal	½	...	...	0	1	10
12th-19th September 1891 ...	Do.	1	...	...	0	3	9
18th „ „ ...	Digging and earthing up by contract ...	...	...	...	2	12	9
18th October „ ...	Watering from the canal	½	...	...	0	1	10
2nd-28th November „ ...	Do.	2¼	...	...	0	8	4
14th-27th December „ ...	Do.	1¼	...	...	0	4	8
12th-26th January 1892 ...	Do.	1½	...	...	0	5	7
4th-19th February „ ...	Do.	1	...	...	0	3	9
3rd-31st March „ ...	Do.	1¾	...	...	0	6	6
19th April „ ...	Cleaning for *gul*-making (18¾ men in six plots, Rs. 4-5-7)	...	...	...	0	11	7
.....	**Gul*-making charges	...	...	...	13	5	4
.....	Canal charges	...	...	...	12	8	0
.....	Assessment	...	...	...	0	10	7
	Total cost of cultivation ...	...	...	...	86	1	9
	Total cost of cultivation per acre ...	...	...	...	344	7	0

* *Note.*—The *gul*-making charges include the hire of a sugarcane mill and boiling pan; &c., and the hire of 8 bullocks which were fed on the tops.

LIBRARY
OF THE
BOMBAY
PRESIDENCY

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1892-93.

[Price—9½ Annas.]

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1892-93.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

CONTENTS.

	Pages.
I.—Forwarding Letter	i— v
II.—Analysis—	
Northern Division	1—19
Central Division	20—35
Southern Division	36—50
III.—Tabular Summaries—	
Northern Division	52—65
Central Division	66—75
Southern Division	76—85

No. A.—3848 of 1893.

FROM

E. C. OZANNE, ESQUIRE, I. C. S., M.R.A.C.,
Survey Commissioner, and Director,
Land Records and Agriculture,
Bombay;

To

G. W. VIDAL, ESQUIRE, I. C. S.,
Acting Chief Secretary to Government,
Revenue Department, Bombay.

Poona, 27th December 1893.

SIR,

I have the honour to submit the Analysis of Crop Experiments for 1892-93 prepared with great care by Mr. J. W. Mollison, the Superintendent of Farms. The submission of the report is somewhat delayed by its unusual bulk.

2. The number of experiments made during the year is shown in the table below:—

Division.	1891-92.	1892-93.		
		Reported.	Rejected.	Total.
Northern Division	30	54	...	54
Central Division	29	34	5	39
Southern Division	24	32	2	34
Total ...	83	120	7	127

Of these three are reported and treated as special experiments and are made up each of one or more ordinary tests. The special experiments were made by Messrs. Phirozshâh Pestanji, R. B. Stewart, and R. E. Kánga.

Only 7 experiments have been rejected. Some have been admitted which perhaps ought to have been rejected. The total number is thus far above the average, and the quality of the work done is most satisfactory.

It is hard to select any special officers for special commendation, but in Mr. Mollison's review and in the following comments thereon it is hoped that the good work done has been adequately acknowledged.

3. I must comment on some of the opinions expressed as regards the burden of assessment. Mr. Mollison has not specially studied the conditions under which assessments are imposed, and, as Survey Commissioner, I may add to his comments occasional explanation.

NORTHERN DIVISION.

4. *Experiment No.* 1.—The land is "new rice" that is dry-crop converted into rice during the currency of the original survey lease, and assessed at revision as rice, but without any charge for the improvement carried out by private capital.

Experiment No. 2.—The lower assessment is due to the elimination of direct assessments on wells at revision settlement.

Experiment No. 4.—Bhátha land, as in this case, because of its low position, is liable to damage by unusual floods. It is recent alluvium, and would fetch, if annually auctioned; many multiples of the assessment. A great deal too much of such land has been inadvisedly given out in permanent occupation; for the area is often liable to change, and, even if the area is permanent, the fertility of the land is not constant, for the river sometimes brings down sand as well as silt. A high incidence of assessment should always be admitted as justifiable on this most valuable land, for it seldom requires manuring, and its tillage costs often nothing but the labour of transplantation and harvesting. Bhátha is eagerly sought for, and though occupants are prone to complain of damage by erosion and sand deposit, they are very ready to make light of these contingencies till their occupation has been secured.

Experiment No. 6.—The late Mr. Cooke has for years personally tested the outturn of crops in Kaira with the express object of studying the incidence of the assessment. He found the comparatively high charges on lands under the Khári irrigation to be fully justified, and in his last experiment, which is now under report, chose rice land away from the Khári to study the justness of the additional increment imposed in classification for facility for growing a late crop after rice has been harvested. In this case the second crop alone, even though he thought it not quite up to average, was worth four times the assessment.

Experiment No. 7.—The assessment includes a charge for tank water, which, though not used this year, is available, and adds to the value of the land. The tank water not used for rice would naturally largely benefit the second crop which has not been tested.

5. Mr. Modi's numerous tests deserve special mention and comment. In considering them, Mr. Mollison's opinion must be borne in mind that the anna estimates are altogether too high. In this opinion I concur. These experiments are most useful at the present time when the revisions of Kaira are in progress.

I need not add to Mr. Mollison's gleanings of agricultural facts and inferences therefrom. The irrigation from the Khári, when it is by flow, costs little, is certain, and sufficiently abundant to allow double cropping annually. The assessment includes the valuation of the water, but it is proposed that the Khári should be declared to be a canal, in which case the people would only be charged when they actually take the water. The survey rating is intended to take into count the average supply, and the incidence appears reasonable, when the saving of irrigation cost is borne in mind. In Experiment No. 14 the crop was an inferior variety of rice when certainly the best rice would grow.

In highly assessed land even a large percentage incidence may leave a full margin of profit to the cultivator. In Experiments Nos. 13 and 14 compared, the balance due to the cultivator in the highly assessed land was only less by Rs. 4 per acre than the balance in the lowly valued land, though the incidence in the former was nearly 26 per cent., and only 8 per cent. in the latter. Undoubtedly a second crop was possible in the former and not likely in the latter. The same comparison may be exemplified from the Report by comparing Experiments Nos. 11 and 12 with Nos. 29 and 30. In both these sets the early and late crops were tested. In the former pair the assessment is high, in the latter low. The incidence is 14 per cent. in the former and only 9 per cent. in the latter. The cost of cultivation of the rice and wheat in each of the two fields could not have differed much, but the balance left to the occupant in the former was Rs. 59 per acre, while in the latter it was only Rs. 24.

I think that these remarks fully justify the large incidence noticeable and noticed by Mr. Mollison with sometimes unfavourable comment. Such comment is made on the wheat tests analysed together on page 7.

Mr. Modi's experiments are taken on fields still under original survey, but it may be stated that in no case at revision has the rice water maximum in the Khári villages been enhanced, while in many of the non-Khári villages it has been reduced.

As to Mr. Mollison's comment on the incidence in Experiment No. 15, where the assessment includes a direct and heavy charge on the well, it may be stated that at revision this direct charge on private capital will be eliminated. That is one of the objects of the revision now in progress in Gujarát.

In some cases exceptional mishap or bad cultivation has raised the incidence. As examples Experiments Nos. 18 and 21 may be instanced where the crop was sown too late for the best return, and where in one case serious damage was done by insects.

Mr. Modi appears to have taken no account of the caste of the cultivators though dealing with a tract where the best and most energetic of Gujarát rayats farm side by side with the indolent Kolis and Musalmáns. The fields of the latter will undoubtedly show a higher incidence than those of the former.

6. Messrs. Modi, Pránlál and Macgnochie all took the special pains of taking tests on both the early and late crops in a field and have given most valuable results thereby.

7. I concur with Mr. Mollison's comments on the Panch Maháls and Broach experiments and would only add from personal knowledge that *láng* in Broach generally means that the surface drainage is defective and that for this reason cotton will not succeed. It is satisfactory then to find that *lang* so well repays the rayát. As a guide to defective drainage *láng* is better than any other indication in this locality. I made a special study of this point in the adjoining Baroda territory in 1890.

8. In the special Broach experiment the experimenter's laborious work has been well analysed, but as the barber enjoys the land at a quit-rent because he is a servant useful to the community, it would have been fair to have debited only the quit-rent and not the full assessment, treating the difference as some equivalent to the time occupied otherwise than in farming.

The deduction from the experiment is that a considerable profit in cultivation sufficient to maintain a fair standard of living can be secured without special care in cultivation, and that therefore with greater skill and care the profits are decidedly large even out of the best cotton tracts of Broach.

9. The Surat experiments are not very careful or valuable, but they give evidence of the value of castor in Gujarát, the by-product of which is so largely used as manure in the gardens of Thána and the sugarcane tracts of Poona.

10. Similar comment applies to the Thána tests, but as they are mostly on second crops in rice land, they afford some information, hitherto scant, on the value of the after-crop in this district. The season was favourable for such crops and the incidence remarkably low in consequence. The assessments in Thána are very low as compared with Gujarát.

Central Division.

11. I think Mr. Mollison was right in rejecting the Khándesh tests. By this time if officers will make mistakes between the capacity and the weight ser, their reports must be considered untrustworthy. Mr. Kázi Kamruddin was careless in his weighments.

12. *Násik.*—Mr. Stewart did not act under standing orders in choosing a holding on which more than three-fourths the area produced no crop. Mr. Mollison is, however, a little oversanguine in thinking that the family could with strict economy have lived on Rs. 58 for a year. Mr. Thatte's *bájri* experiment was rightly rejected when the suspicion remained that he had made a mistake between a half ser and a whole ser measure.

13. *Ahmadnagar.*—The Divisional Inspector, Land Records and Agriculture, C. D., has done satisfactory and careful work in crop experiments in spite of his large charge and heavy other duties.

14. *Poona.*—Mr. Mollison, the Superintendent of Farms, has sent in three careful tests, which will no doubt be a guide to revenue officers, and which add much to recorded facts in Indian agriculture.

15. *Sholápur*:—Mr. Mollison's criticisms on Mr. Heblikar's first experiment should be enough to prevent a further repetition of a practice condemned already in former reviews of crop experiments. Mr. Heblikar's second experiment does not bear out his arguments submitted recently on the revision proposals of the Pándharpur and Sángola tálukas, that the burden of assessment was too heavy even before the revision rates were introduced.

16. In the Central Division Mr. Mollison has had no reason to comment much on any high burden of assessment. The assessment takes into count the liability of these tracts to drought, and as the year was one of excessive rain, there are no indications of a pressure of assessment such as must necessarily be conspicuous in seasons of failure.

SOUTHERN DIVISION.

17. *Dhárwár*:—The work done in this district by Messrs. McNeill and Kánga is excellent. Mr. Mollison has fully analysed the experiments. The area figures under different crops in Mr. Kánga's special experiment are doubtful and must be a pure guess as regards the intersown crop of late *jowári* and gram. A further point of doubt is the value of the after-growth of the kharif *jowari*. Mr. McNeill and Mr. Kánga deserve much commendation.

18. *Kolába*.—Mr. DuBoulay had much difficulty in finding fields for experiments, but though he showed an effort to do the allotted duty it was not of any practical use to test failures in a year when after-crops were decidedly good.

19. *Ratnágiri*.—The reports from this district are of unusual value, and the officers who conducted them have done their work with care, thought, and discrimination. Not only do the results, as Mr. Mollison says, add greatly to existing information as regards the conditions and profits of cultivation in *varkas* lands, but they give very strong corroboration of the reasonableness of the incidence of assessment.

20. The remarks made by Mr. Mollison on the khoti tenure and its hindrance to improvement are fairly correct. Mr. Mollison cannot know anything of the burning questions which his remarks refer to, and his comments will be all the more valuable on that account.

The district is under original survey, it is true, but the survey settlement made is not liable to any general revision as regards field work as in the case of the original surveys still current in the Deccan, which were made at an earlier period in the existence of the Survey Department. The district is thickly populated, the land is comparatively poor, and cannot support its population who largely emigrate for labour. The khoti landlords are not yet showing any signs of energy in land improvement. They rackrent when they deal with tenants-at-will. Mr. Mollison's comment that there is land enough to allow fallowing must be modified. Some of the fallow is necessary to provide ráb for both *varkas* and rice tillage. Other fallow is necessary to allow the formation of new soil in thin land close to the rock where tillage causes denudation. It is elsewhere on record that tillage has spread to the very hill tops and that every available spot, even depressions in the sheet rock on which soil is formed by washing and disintegration which can be worked by plough or by hand hoe, are tilled, and yet large importations of food grains are compulsory.

21. The necessity of fallows is considered in the survey rental. Experiments Nos. 107 to 109 were on good *varkas*, where the periods of cropping are of equal duration with the fallow period. In No. 107 the varkas was probably *bhátle* or superior varkas which but for the exigencies of ráb could be cropped annually. In the next two experiments the land was poorer. If the value of the crops on these three survey numbers is taken together and halved to allow for the fallow, and halved again to allow for the poorer outturns late in the rotation and the comparative excellence of the first field, and the favourable season, the incidence of the assessment is still only 5 per cent. Experiments Nos. 112, 114 and 115 are on poorer varkas. Here if the total value of the crop on the three fields is divided by 3 to discount the longer fallow, and by 2 again to discount the favourable season, which was however not altogether favourable, the incidence works out under 7 per cent.

In Experiment No. 113 an instance of the burden of assessment on newly converted rice land is available. It may be that the conversion entailed some expenditure of private capital, but the rules of the survey claim to eliminate the element of profit due to such expenditure. The cultivation was good but the season unfavourable and yet the incidence is below 7 per cent.

Lastly two of the tests were made on ordinary rice land, an excellent well-tilled field in the one case, and a poorer badly cultivated field in the other. The average incidence comes to 9 per cent.

I think that these facts go to prove the proper distribution as well as the moderation of the survey demand.

22. *Kánara.*—The three tests on *vaingan* rice are welcome. The incidence shown is that on the second crop of *vaingan* after rain rice. If the averages of Nos. 116 to 119 are taken, and the early and late crops considered, the incidence is below 5 per cent. on highly assessed land. The incidence would be lower on the field of Experiment No. 120 if the figures of the rain crop were available, but in Haliyál, the difficulty of field labour is so great that the pitch of assessment is low. The incidence calculated on one crop is only 4 per cent.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Survey Commissioner, and Director
Land Records and Agriculture.

ANALYSIS OF CROP EXPERIMENTS

NORTHERN DIVISION.

Ahmadabad.

Five experiments were reported from this district:—

	Ordinary.
Mr. G. S. Curtis	2
Mr. J. K. N. Kábráji	1
Mr. Motilál Chunilál...	2

Under standing orders Messrs. Curtis and Motilál should have made one more experiment each and Mr. Kábráji two.

Mr. G. S. Curtis, Assistant Collector,

Submits two tests, one on *sutarsál* rice, the other on wheat. The field under rice (Exp. No. 1) has been assessed at revision survey as "new rice," *i.e.*, as dry crop converted into rice land. It has middling *gorádu* soil bearing an assessment of Rs. 2-14-7 per acre. It is irrigated in some years from the Chándola tank. The Irrigation Department make a charge of Rs. 7 per acre. When water is obtainable from this source, rice is grown otherwise only dry-crop. A portion of the holding has been dry-crop and a portion rice for many years. During the last four years *bájri* and *tur* was the mixed dry-crop during two years, *bájri* alone in the other two. The *sutársál* rice was raised from transplanted seedlings. Excessive rain damaged the seedlings, but the season was favourable on the whole. The field was manured with about 8½ cart-loads per acre of ordinary manure. The seed rate, 9 lbs. per acre, is less than the formulæ. The seed was sown in the seed-bed in June and the seedlings were ready to transplant late in July. The crop which ripened at the end of October produced 1,386 lbs. grain. This was locally estimated as a 16-anna outturn, but is less than 11 annas according to formulæ.

This officer's wheat test (No. 2) was taken on a field which at the original settlement was classed as *bágáyat* and assessed at Rs. 21. In the revision survey it has been entered as *jiráyat* and the assessment lowered to Rs. 13. The soil is *gorádu*. Ordinarily a second crop is not taken after the rice crop. The season was favourable for the late crop in respect of an abundant rainfall which left moisture in the soil and plenty of water in the well, but unfavourable in that cold cloudy weather and light rain in January-February caused the crop to rust, the effect of which was to lower the quality of the grain and necessarily lessen the outturn also. Still the latter was very satisfactory. The crop yielded 1,962 lbs. grain and 2,000 lbs. straw per acre. The experimenter remarks that the yield was most unexpectedly large. For a crop damaged by rust it was certainly so.

Mr. Curtis reports that the effect of rust lowered the value of the grain from Re. 1-12 to Re. 1-6 per maund. If this was the case then I fail to see how the outturn could correctly be estimated at 16 annas. If the rust attack was serious then I am sceptical regarding the accuracy of the reported outturn figures.

Mr. J. K. N. Kábraji, Assistant Collector,

Sends a test (No. 3) on *vágadia* cotton. The bolls of this variety remain closed when the crop is ripe. The capsules have to be forced open by hand before the lint can be extracted. This necessarily soils the fibre and lowers its commercial value. Only in one respect is the experiment unsatisfactory; an average field was not selected. The outturn is admittedly about double that of the other fields of the village and may be accepted as more than a full average for the field. This result is partly due to the situation of the field which occupies rising ground. Thus it escaped injury from excessive rain because its position saved it from excessive wetness. Another factor of success was a heavy dressing of manure applied this year. The manure is allowed to accumulate for five or six years. This accumulation allowed an application of 30 loads

per acre this year to the whole field. The field has red *gorádu* soil and bears an assessment of Re. 1-0-7 per acre. The seed rate (25½ lbs.) is much higher than usual. It is noteworthy that the crop had to be sown twice because the heavy application of manure *burnt* the first seedlings. This practically means that the manure kept the soil so open to begin with, that during a break in the rains the plants withered for want of moisture. This not unfrequently occurs under similar conditions. The seed was sown by a *vavania* and covered with a *kàlìu*. The seed was sown the second time in July. Owing to heavy rain the crop was not so free of weeds as it ought to have been, although it was repeatedly weeded. The bolls were gathered twice, the first time on the 13th April and the second time on 23rd April. The second picking was insignificant. This indicates one advantage of this variety of cotton. The bolls even when ripe may be left on the plants without any risk of the lint being spoiled by falling to the ground. There is of course risk of theft and risk of the boll worm doing considerable injury to the lint. The whole field (4 acres 33 gunthas) was picked under the eye of the experimenter and the acre average is therefore accurate. The cotton in the pod weighed 444 lbs. per acre. The experimenter took the trouble to test the relative proportions of seed cotton to by-products with the following results:—

		Sers	tolas.	
160 sers of pod cotton yielded ...		143	5	seed cotton.
		53	25	capsule shells.
		3	10	*gogdas* (immature capsules).

The seed cotton was ginned and gave 35·1 per cent. lint and 64·9 per cent. seed. In 1890-91 the same variety gave 32·5 per cent. of cleaned cotton. The outturn of clean cotton per acre amounts approximately to 126 lbs. The cultivator had sold his pod cotton, while yet unripe, at Rs. 2-12-0 per maund, but the price fell to Rs. 2-9-0 and Rs. 2-8-0 per maund at the time of the 1st and 2nd picking. The values entered by the experimenter are calculated on the latter rates and not on the actual price got by the cultivator, that price being a speculative one.

Mr. Kábráji's experiment affords information of value and of interest.

Mr. Motilál Chunilál, District Deputy Collector,

Sends two rice tests; *kamod* rice was grown on each field and the season was reported unfavourable on account of an excessive rainfall. *Kámod* is a fine variety requiring plenty of water. In the second test there is nothing to show that the excessive rain damaged the crop in the slightest; on the contrary the outturn results are quite satisfactory. As regards the first field (Exp. No. 4) its situation is accountable for the comparatively poor outturn. This field has *bhátha* soil and once formed part of the bed of the Sábarmati river. It grows sugarcane in rotation with rice and is assessed as *bágáyat* at Rs. 11-14-1 per acre. This year, owing to excessive rain, the crop was damaged by flood water as the crops in many other low-lying rice fields were. The crop was unmanured, but it is not likely that this affected the outturn, because the previous crop was sugarcane; a crop that must necessarily be heavily manured, or at least be grown on land in high manurial condition. No doubt the soil of this field like all *bhátha* soils has great natural fertility. The seed rate (9¼ lbs. per acre) is low; and this is the more striking as the area of seed-bed to acre of transplantation is high. It is reported as 6·3 gunthas per acre. It is not at all likely that a good cultivator would have prepared a seed-bed of that size for the reception of only 9¼ lbs. of seed. The seed-bed was irrigated 12 times, and the seedlings were ready for transplantation in September. The crop ripened at the beginning of December. The outturn estimated at 9 annas amounts to 1,067 lbs. grain and 768 lbs. straw. The relative weight of by-product is light. The gross value of produce amounts to Rs. 38-2-5 per acre. The incidence of assessment is 31·14 per cent. This even in an unfavourable year indicates that the burden of assessment is heavy; but the holder intended raising a second crop on the land.

Ten lbs. per acre is the reported seed rate of the second crop experimented upon (No. 5); and the area of seed-bed to acre of transplantation is stated to have been 7·2 gunthas. Again, I think the information inaccurate. The seed-bed was irrigated ten times and the whole field thrice. The field is *khari*, *i. e.*, embanked rice land. The assessment is Rs. 3-10-2 per acre. The results indicate that the

burden is light. The crop estimated at 14 annas amounts to 1,629 lbs. of grain and 2,360 lbs. straw, together worth Rs. 61-15-5. The field was manured before sowing. The dates of seed time and harvest were much the same as in the other test.

Kaira.

In all twenty experiments have been received from this district. One on gram from the late Mr. H. R. Cooke, the Collector; 1 on rice, 1 on *bávto*, and 2 on *kodra* from Mr. Lawrence; and 5 on rice, 4 on wheat, 3 on gram, 2 on *kodra*, and 1 on *bávto* from Mr. Modi. The last are both carefully made and well reported.

Mr. H. R. Cooke, Collector,

Forwards a gram test (No. 6) which shows excellent results. The experiment was made on *besar* rice land assessed at Rs. 5-7-0 per acre. The field grows rice every year and a second crop of gram when the season allows, which is only once in 4 or 5 years. The seed was obtained from Dabhoi, a Gaikwári village noted for producing good gram, and is locally called *Dabhoi Chaña*. The season was exceptionally good for the second crop and also was favourable to the rice, which, the cultivator admitted, produced 60 local maunds (2,460 lbs.) of grain in husk, presumably from the field (2 acres 12 gunthas). The field was well cultivated. The gram was not directly manured, but 10 cart-loads of ordinary manure were applied for the rice. As usual the gram was drilled with the *orni*, *i. e.*, a single seed tube attached to a plough. The field was ploughed and the seed sown at one operation. The seed was sown (35 lbs. per acre) in November and the crop was ripe in February. The by-product was not valued. The crop yielded 907 lbs. pulse worth Rs. 23-9-11 per acre. This outturn is perhaps underestimated at 12 to 14 annas.

Mr. H. S. Lawrence, Assistant Collector.

Sends four tests, one on *sutarsál* rice, one on *bávto*, and two on *kodra*. The experimenter reports "the season to have been exceptionally favourable for rice; for *kodra* the heavy rainfall was disastrous, and *bávto* was beaten down and damaged by excessive rain."

The rice crop tested (No. 7) was an average one of the highly assessed land of Boriávi, a village noted for good cultivation. The field is embanked rice land and bears an assessment, inclusive of water rate, of Rs. 10-15-2 per acre. In years of light rainfall water is taken from an adjoining tank. No irrigation was required this year. The field grows rice every year. A second crop of gram was grown this year, which Mr. Lawrence was about to test when he was transferred to Sind. A double test would have added interest to the experiment. The management of the field was liberal and the cultivation good. Thirty loads ordinary manure were applied per acre before sowing. The crop was drilled and the reported seed rate is 33 lbs. per acre. Sown in June the crop ripened in October and yielded 1,596 lbs. grain and 1,850 lbs. straw. The gross value of produce amounts to Rs. 45-2-8. This represents a 13-anna crop. The burden of assessment is high. The incidence works out 24·24 per cent. A second crop of gram was grown; the value of which would tend to lower the incidence.

This officer's *bávto* test (No. 8) may be compared with Mr. Modi's (No. 25). A comparison indicates that the latter officer's anna valuation is much too high. The crop tested by Mr. Lawrence was indifferently cultivated. The field was weedy. The soil is *goráḍu*, assessed at Rs. 3 per acre. 10⅔ loads ordinary manure were applied per acre before the rains. The crop was grown from transplanted seedlings. Half the seedlings failed in the seed-bed owing to deficient early rainfall. The remainder was sufficient to plant 1½ acres. Ten pounds of seed had been sown; so the seed rate works out about 6⅔ lbs. per acre of transplantation. Under favourable circumstances half that quantity would therefore have sufficed. A drill was used to mark out the rows into which the seedlings were transplanted by hand in July. A plough is commonly used to open a furrow in which the seedlings are planted by hand, and the plough in making the next furrow moves soil sufficient to cover the roots. There was a sprinkling of castors with the *bávto*; but the oil-seed was not tested. Ten pounds of castor seed had been sown on the field (1½ acres). The *bávto* ripened towards the end of October and produced 582 lbs. grain and 375 bundles straw per acre. This outturn was estimated locally at 8 annas. The gross acre value of produce amounts to

Rs. 15-7-0. The incidence of assessment works out 19:43 per cent., which for an 8-anna crop is perhaps a little high; but as already stated, the value of the subordinate crop was not taken into account.

The seed-rates as reported in each of this officer's *kodra* tests are higher than usual. That of the first (No. 9) experiment (28 lbs. per acre) is more than double the quantity usually sown. This crop had subordinate to it *tur*, *ámbádi*, and *til*. The two latter formed a mere sprinkling, but the *tur* should have been well in evidence, as about 2 lbs. per acre had been sown. In the second test (No. 10) *kodra* was grown as a sole crop, and about 20 lbs. seed per acre sown. It is uncommon to find *kodra* without a subordinate mixture in Gujarát. The explanation is that the field tested has only been reclaimed from waste two years, and the well known exhaustive effect of *kodra* as a sole crop will not become evident, until the land has been cropped for some years. For a sole crop 15 lbs. or less per acre of seed should prove sufficient. The excessive wetness of the season not only lessened the outturn of both crops but produced a diseased condition of the grain in the first field. The name *minio* is given to diseased grain in contradistinction to *mitha* sound grain. The names do not, I think, signify different varieties, although that is often affirmed. *Minio kodra* has a well known poisonous intoxicating principle, dangerous to man and beast. The experimenter remarks that poisonous *kodra* is disposed of by the Bania by mixing it with sound grain in the proportion of 1 to 20. In this way the narcotic effect is minimized, so that it is not noticeable by the purchaser. Each field experimented upon has *gorádu* soil. The first is assessed at Rs. 2-14-8 per acre and was manured with 12 cart-loads of ordinary manure before sowing; the second is assessed at Re. 1-5-6 and received also before sowing an application of 12 cart-loads per acre. The first field grew mixed crops in each of the last three years, *bávto* with *math* and *mug* in 1889, *kodra* with *tur* and *ámbádi* in 1890, and *bájri* with *chola*, *math* and *mug* in 1891. The second field, since it was reclaimed, has grown two successive crops of *kodra*. The outturn results from each field are tabulated below. The anna estimate of the second crop is far too high:—

Experiment.	Estimate in annas.	Out-turn of grain per acre.	Value of Produce.
	As.	Lbs.	Rs. a. p.
First field (Exp. No. 9) ...	6 to 7	591	12 9 8
Second „ (Exp. No. 10) ...	14	532	11 5 9

Mr. R. E. Modi, District Deputy Collector,

Reports in all fifteen tests, of which five were taken on rice, four on wheat, three on gram, two on *kodra* and one on *bávto*. Mr. Modi deserves credit for the concise and careful manner in which his reports are drawn up, and for the painstaking labour which his experiments must have entailed.

The season was an exceptional one. The rainfall was much above average and heavy rain fell very late in the season, an unusual circumstance in Kaira. The direct effect was that although rice fields may have been slightly damaged by heavy down-pours of rain, the loss was counterbalanced by a saving in respect of artificial irrigation which is ordinarily required, at least for the late ripening fine quality varieties. Second crops after rice throve well because enough moisture remained in the soil, after the rain crops were harvested; to properly mature the rabi ones. Excepting rice all other rain cereal crops in Gujarát were much below average. *Juvár* and *bájri* suffered most. The disastrous effect of heavy and continuous rain was less marked on light *gorádu* soils than on the heavier *besar* land, and this probably accounts for the fairly good results obtained by Mr. Modi on *kodra* crops grown on the former description of soil. The experiments are valuable, not that they indicate correctly the average results of cultivation in the district, but because they show that in a year of heavy and unseasonable rainfall some of the crops commonly grown did not suffer nearly so much as others, a circumstance which clearly shows

the advantage of growing mixed crops. This advantage the Gujaráti cultivator fully appreciates. The experiments deserve careful analysis. I will first compare those on rice. Five tests were taken on three well known varieties, *viz.*, two on *kamod*, one on *jirásál*, and two on *sutarsál*. The two former are fine varieties, the latter is rather inferior. The respective market rates per local maund (41 lbs.) of grain were Re. 1-8-0, Re. 1-4-0 and annas 14.

Each of the two fields under *kamod* has *besar* land slightly salt. Both fields are irrigable by flow channels from the Khári river canal. The first field (Exp. No. 11) bears an assessment (soil and water combined) of Rs. 9-9-2 per acre, the second (Exp. No. 13) an assessment of Rs. 3-5-4 per acre; each field usually grows a second crop of wheat. In both fields excessive rain lodged the crops and somewhat injured them. To the first field 17 cart-loads of ordinary manure per acre were applied before the rains. To the second 22 loads per acre were similarly given. Each crop was transplanted rice. But the second was raised from seedlings which grew from seed artificially sprouted before being sown in the seed-bed. This system of sowing the seed-bed is called *varudia* in contradistinction to the *varápia* system, *i.e.* ungerminated seed sown. For a *varudia* seed-bed the seed is prepared thus: five sers of rice are taken for each bigha to be transplanted (about 8 lbs. per acre) and soaked in water in a vessel for two days. The grain is then placed in a heap on a floor and covered with straw which is overlaid by quilts which are weighted down. The grain germinates and is ready for broadcasting in four days. Water should stand to a depth of three inches on the seed-bed when the seed is broadcasted. Three or four days afterwards the water is drained off. Failing heavy rain the seed-bed is watered for a month every fifth day. This method of sowing, though risky, admits of early transplantation, a point of considerable importance. In the *varápia* system sowing is delayed until the seed-bed is ready. It is difficult to prepare the seed bed properly until after the first fall of rain. By artificial sprouting germination and growth are progressing at the same time that the seed-bed is being prepared. The proportional area of seed-bed to acre of transplantation is not reported in either test, but 11 lbs. per acre is the seed rate of the first field, 8 lbs. per acre of the second. The seedlings in each case were ready for transplantation late in July and both crops were harvested on 23rd November. The anna valuations of all the experimenter's tests are reported to be based upon the capabilities of the fields as indicated by outturns of previous crops, but I feel sure that the anna estimates are nearly all much too high. The outturn results from each *kamod* crop I tabulate below :—

Experiment.	Anna valuation.	Outturn per acre.		Gross value of outturn.
		Grain.	Straw.	
		Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 11)	18	1,288	1,992	48 15 7
2nd „ (Exp. No. 13)	18	1,042	1,672	39 10 11

A crop of wheat was taken on the second field as a second crop, but it was very poor. This is attributed to the salt nature of the ground and to mildew. The burden of assessment on the first field is decidedly high. It works out 19·54 per cent. A fairly good second crop of wheat was grown on this number and tested by Mr. Modi; the aggregate values of the rice and wheat crops amount to Rs. 67-14-11. The incidence of assessment works out on the double crop 14·09 per cent.

Jirásál rice (Exp. No. 14) gave somewhat better results on good *besar* rice land, also irrigable from the Khári canal and assessed at Rs. 10-14-11 per acre. The field grows a second crop every year. Seventeen loads per acre of ordinary manure was applied. The crop was grown from seedlings transplanted in July. These were raised from artificially sprouted seed; 8 lbs. per acre is the reported

seed rate. The crop was ripe on the 18th November and its outturn result is given below :—

Anna valuation.	Outturn per acre.		Gross value of outturn.
	Grain.	Straw.	
	Lbs.	Lbs.	Rs. a. p.
18	1,337	2,112	42 12 0

If the anna valuation is correct (which is very doubtful) then the burden of assessment must be very high in a most favourable year.

Two tests (Nos. 15 and 16) on *sutarsál* rice may be compared with the foregoing and with each other. Each field has *besar* rice land. Each bears the same assessment (Rs. 7-8-0 per acre). The first field is watered from a well, the second from a well and also from a tank. Neither fields required irrigation this year, the rains being sufficient. Second crops of wheat or barley are taken every year. To the first field 18 cart-loads per acre of ordinary manure was applied ; to the second an unusually heavy application consisting of 30 loads ordinary manure and 8 maunds (328 lbs.) of castor cake per acre. The latter was used because it was the remnant left after manuring a sugarcane crop in another field. The cultivation of each field is reported as good. Ungerminated seed was sown in the nursery seed-bed of each field. As usual the seed-bed was well manured and ploughed. The seed was broadcasted by hand (10 lbs. for each acre of transplantation), and covered by ploughing it in ; afterwards the *samár* or plank roller was used twice to smooth the surface. Failing heavy rain the seed-bed is watered at intervals of fifteen days ; the seedlings were transplanted in July. The crops were harvested on 25th and 28th October. The crop of the second field undoubtedly benefited by the heavy dressing of manure. The outturn results are tabulated below :—

Experiment.	Anna valuation.	Outturn per acre.		Gross value of produce.
		Grain.	Straw.	
		Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 15)	18	1,600	2,136	36 2 0
2nd „ (Exp. No. 16)	20	2,470	4,754	57 2 10

The burden of assessment appears high on the first field. A good second crop after the rice would, however, lessen it materially.

This officer's four wheat tests gave in each case fair results. The season was specially favourable. Two of the crops were damaged by mildew. The first field tested (No. 17) has *besar* rice land assessed at Rs. 6-5-6 per acre. The occupant was unfortunate this year. On account of deficiency of water early in the season he was only able to sow half the field with rice. Ordinarily the whole field would have been under rice and a second crop of wheat, barley or gram taken. A small portion of the wheat was a second crop after the rice, but the greater portion was grown on land which was fallow during the rains. This part was not manured. Excessive late rains delayed sowing until December. 75 lbs. per acre was the seed rate ; the seed was drilled. The crop was once irrigated from a well. It was harvested on the 12th March. The variety grown is described as *white* wheat worth Re. 1-7-0 per maund of 41 lbs.

Dáudkháni was the subject of the second wheat test (No. 18). This variety is reported as worth Re. 1-6-6 per local maund (41 lbs.). This crop was a second crop after rice. The field has black rice soil and was manured for the

rice crop with 14 cart-loads of ordinary manure per acre. The field can be irrigated from a flow channel from the Khári canal, but only one watering was required. The assessment (soil and water combined) is Rs. 10-14-6. 83 lbs. per acre of seed was sown broadcast after the rice stubble was ploughed four times. The plank roller (*samár*) was used after each ploughing to crush clods. The seed was sown at the end of November and the crop was ripe on the 14th March.

The third wheat crop tested (No. 12) was of the *kátha* variety. The field which carries a rain crop of rice and a second crop of wheat every year has *besar* land and bears an assessment (soil and water combined) of Rs. 9-9-2 per acre. The cultivation of this year's wheat crop was almost identical with that of the previously tested crop. The seed rate (90 lbs. per acre) is slightly higher. Seed time and harvest occurred about the same dates as in the previous test. Showers during February caused mildew.

This officer's fourth wheat test (No. 19) gives an outturn estimated at the bumper standard. The anna valuation is far too high. The crop selected was above the average of the village and was chosen to show the effect of specially careful tillage and a heavy dressing of manure. The field has been used as a nursery for rice seedlings, and the seed-bed was prepared for sowing as follows.

After manuring with about 25 loads ordinary manure per acre, the field was twice ploughed. Thereafter the *samár* or clod-crusher was used after an interval of four days. The field was again ploughed and cross-ploughed; before the last ploughing leaves of the *varkhada* tree, 280 to 320 lbs. per acre, were ploughed in as manure. Sprouted rice was broadcasted on the seed-bed which at the time was covered with water standing three inches deep. This water was drained off after an interval of three or four days when the seedlings had properly rooted. The bed was again watered and again a second time eight days later; meantime castor cake crushed to a fine powder was used as a top-dressing applied at the rate of 200 lbs. per acre. The wheat was not directly manured but must have benefited by the residue left from the rain crop.

The field consists of *besar* rice soil. It is twice cropped every year. Wheat is invariably the second crop. It bears an assessment of Rs. 9-2-0 per acre and is irrigated by channel from the Khári canal. The experimenter does not state how often the wheat crop was watered; probably it was irrigated once like other crops in the district. The preparatory tillage consisted of twice ploughing the rice stubbles and levelling with the *samár* (clod-crusher). *Kátha* was the variety grown. The seed was broadcasted in November; 100 lbs. per acre is the reported seed rate. The crop was ripe by the middle of March. It was damaged slightly by mildew on some parts of the field. I tabulate for comparison below the outturn results and anna estimates of each of the wheat crops experimented upon :—

Experiment.	Anna valuation.	Outturn per acre.		Value of outturn.
		Grain.	Straw.	
		Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 17)	18	507	565	18 6 7
2nd „ (Exp. No. 18)	18	405	435	14 5 8
3rd „ (Exp. No. 12)	16	517	897	18 15 4
4th „ (Exp. No. 19)	20	897	1,112	32 7 8

In each case the burden of assessment even for a second crop is high. The weight of straw reported in each experiment is unusually light, and so much so

in comparison with the grain that I doubt the accuracy of the by-product figures.

Two of this officer's gram tests gave capital results, the third gave a poor outturn. Gram was this year grown largely in Gujarát. The moisture left in the rice fields by copious late rains specially favoured the cultivation of gram on such land. On purely dry-crop lands this pulse was also more widely cultivated than has been the case for years, and this was entirely owing to the late rainfall which the cultivators thought specially favourable for this crop. Seed could not in many instances be obtained locally and was bought at much higher rates than usual and much higher than the produce commanded.

The first test (No. 20) was taken on *gorádu* rice land. The field bears an assessment of Rs. 7-9-4 per acre. The gram was a second crop after drilled *sutarsál* rice. The rice was a poor crop. The land was not manured this year. The seed which cost Rs. 2-9-0 per maund (41 lbs.) was sown at the beginning of November through a tube fixed behind a plough. The seed thus dropped into the furrow was covered by the soil moved by the plough in making the next furrow. The seed rate was 27 lbs. per acre. The crop was harvested at the beginning of February.

The second gram crop tested (No. 21) was sown on *besar* rice land assessed at Rs. 6-5-6. The cultivator was unable to sow his whole field as usual with rice; the portion under gram lay fallow during the rains. It was unmanured. 35 lbs. per acre is the reported seed rate. The seed was sown rather unseasonably in the middle of December. As in the previous test the field was ploughed and the seed sown at one operation. The crop ripened in three months. It was seriously damaged by caterpillars or grubs in the pods. This was a common cause of loss in the district. The 18-anna estimate is much too high.

Ordinary dry-crop *gorádu* soil assessed at Rs. 3-5-4 gave better results (Exp. No. 22) than either of the other fields. This field was manured with 17 carts ordinary manure in June but owing to an excessive rainfall it lay fallow during the rains. It grew in the previous year *kodra*, *bájri*, *guvár* and *tur* and may be described as land which usually grows *bájri* with the subordinate mixtures (*kathol*) common in the district. The seed was sown as in the other two fields tested, but the seed rate is higher; 43 lbs. per acre were sown at the end of November and the crop was ready in the third week in March. The experimenter reports the by-product in each test as having no value. He is entirely mistaken. The leaves and pod husks of gram are specially valuable for mixing with the chaff of other fodders; a slight acidity is imported to the mixed *kutár* by the gram chaff and the mixture is eagerly eaten by all kinds of stock. The outturn results of each test are tabulated below :—

Experiment.	Anna estimate.	Outturn per acre.		Value of pulse per acre.
		Pulse.	By-product.	
		Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 20)	20	1,194	1,008	28 3 1
2nd „ (Exp. No. 21)	18	343	395	7 13 7
3rd „ (Exp. No. 22)	20	1,238	605	28 4 10

The incidence of assessment on the first test is 26·89, on the second 80·82, and on the third 11·77 per cent. The burden of assessment is very high in the second field tested. The field is usually twice cropped; but the gram was the sole crop of the year. The high incidence is not satisfactorily explained.

Two tests (Nos. 23 and 24) on *kodra* by this officer afford useful comparison. Each crop was grown on ordinary dry-crop *gorádu* soil. The first field bears an assessment of Rs. 3-3-4, the second an assessment of Rs. 6-6-10 per

acre. *Kodra* was the principal crop in each field and the subordinate mixtures were in each case the same. The seed rates were as follows:—

	First field. Seed per acre.		Second field. Seed per acre.	
	Lbs.	Tolas.	Lbs.	Tolas.
Kodra	13	0	11	37
Rátadia Juvár (red jowári)	0	33	1	27
Tur	3	15	3	15
Sheria (ámbádi)	0	16	0	33
Til (seasamum)	0	33	0	16

The seeds were mixed as usual before sowing and were sown by drill. Owing to the exceptional character of the season the *kodra* only did well. *Tur* was poor in the first field but better in the second. The other subordinate crops practically failed. There was only a plant here and there. The first field was lightly manured; the second got a liberal application of manure (18 loads per acre). For the first field a second sowing at the end of June was required as the first sowing failed. The second field was sown also at the end of June. Each crop was ripe early in November. The outturn results are tabulated below:—

Experiment.	Anna estimate.	Acre outturn.		Value of outturn.
		Grain.	Straw.	
		Lbs.	Lbs.	Rs. a. p.
1st field (No. 23) ...	20	807	788	16 9 7
2nd „ (No. 24) ...	19	868	1,332	17 13 6

The incidence of assessment on the second field works out 36·01 per cent., nearly double that of the first; both are high, but it must be remembered that in each field the value of the subordinate crops is not taken into account, and although the *tur* at date of experiment may have looked unpromising, it does not follow that it did not yield fairly well when it reached maturity two or three months later. *Tur* almost invariably recovers on such land after the other crops are harvested.

A test (No. 25) on *bávlo* (Eleusine coracana) by Mr. Modi, is the last of his to be noticed. The crop suffered from excessive rain. The field has *gorádu* soil assessed at Rs. 4-5-0 per acre. This field like similarly classed land in the Kaira district grows a mixed crop almost every year. The mixture amounts practically to a rotation even though there is not much variation in the mixture from year to year. *Bájri* with subordinate pulses was grown during the four previous years, but before that the field grew a mixture of *kodra*, *tur* and *til*. It is not quite clear why *bávto* was grown this year unless as a change to rest the land. Ten cart-loads of manure was applied before the rains. The crop was raised from transplanted seedlings. The seed-bed was near to and irrigated from a well. Four pounds per acre is the reported seed-rate, but the area of seed-bed to acre of transplantation is not stated. The seedlings were transplanted late in July and the crop was ripe at the end of October. It yielded 593 lbs. grain and 944 lbs. straw. Tkis was estimated as a 16-anna outturn. The anna valuation is absurdly high. Compared with results of tests in former years on similarly classed land in the same district it should not be valued at more than half the average standard.

Panch Maha'ls.

Three reports from the Assistant and six from the District Deputy Collector have been forwarded from this district.

Mr. E. Maconochie, Assistant Collector,

Submits three tests, two on rice and one on gram. The latter crop was grown as a second crop on the same field as that previously tested for rice, and this attaches extra interest to the experiment.

The first field (Exp. No. 26) has *gorádu* soil assessed at Re. 1-9-3 per acre, and carries rice every year. For the 1891 crop farm-yard manure was rather liberally used. This year tank-mud (50 loads per acre) was applied. Early showers in June induced the cultivator to sow, but a long break necessitated a second sowing. The seed was sown in a seed-bed. The experimenter thinks the seed rate noted is too high; seedlings were transplanted in July. Subsequently a heavier rainfall than usual favoured the rice and made it possible to take an after-crop of gram which is not usual on such land, but the practice was general this season. The rice crop was ripe in October, and although the cultivation is described as indifferent, the outturn is fair; 1,231 lbs. grain and 1,490 lbs. straw classes the crop a 14-anna one with a gross value of Rs. 22-7-2 per acre. The variety grown was inferior *gámadia* rice worth about 59½ lbs. per rupee.

Gram followed this crop and was the subject of Mr. Maconochie's third test (No. 27). The soil of the field is described as thin with rock below, yet in a favourable year it not only gave a fair rice crop but a good second crop also. The gram yielded well. It produced a 16-anna outturn of 820 lbs. pulse and 645 lbs. of chaff, &c. The latter is, I think, undervalued at Re. 1-4-0 per acre. The seed rate is considerably overestimated at 131 lbs. per acre. The incidence of assessment works out 7·42 per cent. which is low for a second crop. The experimenter omits to note if the second crop occupied the whole of the rice area or only a part of it. On the former supposition the incidence on the joint crops would work out 3·6 per cent.

This officer's second test (No. 28) was taken on rice grown on *bhuri gorádu* soil which grows rice every year and is only assessed at Re. 0-13-1 per acre. The crop was raised from seedlings transplanted in July. The first sowing failed because the early rains were scant. The field was manured in May with 15 cart-loads ordinary manure. The cultivation is described as good and the season favourable. The crop was ripe in October and yielded 1,589 lbs. grain and 2,100 lbs. straw, worth Rs. 38-9-6 per acre. The incidence of assessment works out 2·11 per cent. only. A second crop of wheat or gram was intended to be grown and this would reduce the incidence still lower. A second crop, however, is taken only in years of favourable rainfall.

Mr. Pránlál Harkisandás, District Deputy Collector,

Reports six tests, two on *sutarsál* rice, two on *kamod* rice, one on wheat and one on gram with subordinate rows of barley. For early ripening coarse varieties of rice such as *sutarsál* the season was unfavourable, because the late rains damaged these crops as they approached maturity. For late ripening fine varieties of rice, such as *kamod*, the season was favourable. All the rice fields experimented upon grow second crops every year. The after-crop in the second field is either barley or gram with subordinate rows of barley. In the three others it is invariably wheat.

I will first contrast the two *sutarsál* crops. Both were grown in fields having *gorádu* soil and both crops were broadcasted rice. The seed rate of the first is 164 lbs. per acre, of the second 102. The one is more than double, the other more than treble the formulæ. The respective assessments are Rs. 2-7-0 and Re. 1-11-10 per acre. The first field was manured with about 10 loads ordinary manure per acre before sowing. The second was unmanured. Each field was sown on the 25th June, and each crop was ripe at the beginning of November. The outturn results are tabulated below:—

Experiment.	Anna estimate.	Outturn per Acre.		Value of outturn.
		Grain.	Straw.	
	As.	Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 29).	8	738	1,198	18 4 0
2nd „ (Exp. No. 31).	6	533	480	11 14 3

N.B.—The anna estimates are in each case too low.

The market rate of *sutarsál* rice is quoted at nearly 52 lbs. per rupee. If the season had been favourable and the crops average, the burden of assessment would have been light.

Kamod rice in two other fields (Exps. Nos. 33 and 34) gave much better results. These fields are assessed rather higher than the *sutarsál* fields. The soil is *gorádu*, but neither field was manured. Each crop was grown from transplanted seedlings. The seed-rates are respectively 27 lbs. and 23 lbs. per acre. In the first field the area of seed-bed to acre of transplantation is reported at $1\frac{3}{4}$ gunthas; in the second $1\frac{1}{2}$ gunthas. The seed was sown in the seed-beds late in June, and the seedlings were ready early in August. Each field was being harvested on the 10th November. The outturn results are shown below:—

Experiment.	Estimate in annas.	Outturn per Acre.		Value of produce.
		Grain.	Straw.	
	As.	Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 33)	16	1,718	1,575	47 2 0
2nd „ (Exp. No. 34)	14	1,395	1,198	38 0 0

The *kamod* rice was worth 41 lbs. per rupee. Irrespective of a probable fair return from a second crop, the incidence on assessment is low; and the burden of assessment in each field appears decidedly light, if the incidence on assessment is calculated on the rain crop only.

This officer tested the after-crops in each of the *sutarsál* rice fields. The first field grew wheat (Exp. No. 30) as a second crop; the second, gram, with subordinate rows of barley (Exp. No. 32). The results in each case were poor. The outturn was about $1\frac{1}{3}$ times seed in the wheat test and not quite three times the seed in the other. It is not at all likely, however, that the seed rates as reported are correct. 164 lbs. per acre for wheat is an extravagantly high seed rate; and 72 lbs. of gram with 16 lbs. of barley may be similary described. Each crop was drilled in the third week of November and ripened in the fourth week of March. The interval is over four months. This indicates that there was enough moisture in the soil to properly mature the crops; and the poor outturn can only be explained by the exhausted condition of the soil. The ordinary cropping as already noticed is rice followed by wheat or by barley and gram every year, a combination which is bound to exhaust the best rice land sooner or later unless manure is liberally applied. This year in the second field no manure was given to either the rain or rabi crop, and the occupant could hardly expect better results than he got. The outturn results of the second crops are tabulated below:—

Experiment.	Estimate in annas.	Outturn per Acre.		Value of produce per acre.
		Grain.	Straw.	
		Lbs.	Lbs.	Rs. a. p.
1st field (Exp. No. 30).				
Wheat ...	6	226	513	8 8 11
2nd field (Exp. No. 32).				
Gram ...	4	172	144	3 2 5
Barley ...	8	78	61	1 1 10
				4 4 3

The wheat is reported worth 35$\frac{1}{7}$, barley 69$\frac{3}{4}$, and gram 54$\frac{2}{3}$ lbs. per rupee. These are cheap rates.

Broach.

Mr. Batchelor submits three ordinary experiments from this district and Mr. Phirozsháh a special as well as an ordinary test. All are well reported and afford valuable information.

Mr. S. L. Batchelor, Assistant Collector,

Reports three tests, one each on *juvár*, wheat and *láng*. These crops were specially selected because experiments on the same crops last year indicated that the burden of assessment was rather high in the Broach, A'mod and Jambusar tálukas. Throughout these tálukas the rainfalls of 1891 and of 1892 were sufficient and in each year the season was specially favourable for late crops. In comparing the results of each year's experiments the effect of season may therefore be disregarded. Although the anna estimates are lower this year than last the percentage incidence of assessment is also lower. I think, however, that the local estimate in annas was last year too high. The incidence of assessment though high this year is not abnormally so, and the heaviness of the assessment burden is explained thus : cotton is the rent-paying crop ; the crops experimented upon are rotation crops with cotton and are distinctly subsidiary to it. They take the place of a bare fallow. A few of the richer cultivators instead of growing *juvar* or wheat leave the field fallow for a year and the succeeding cotton is very fine.

As regards the first field tested (No. 35) the above explanation does not hold good. It grew *láng* (Lathyrus sativus). It has good deep black soil and but for the position of the field would grow good cotton. It is assessed at Rs. 3-15-2 per acre. It lies low and remains too wet for rain crops, but its position is favourable for *láng* as dampness in any ordinary degree benefits that crop. The season was favourable for *láng* because there was sufficient moisture in the soil and bright sunshine when the crop was in flower. At this period cloudy weather seriously damages the crop. The field was unmanured. The cultivator contends that deep black land is not benefited by manure because although the yield may be thereby increased the advantage is more than counterbalanced by extra costs incurred for weeding. I tabulate for comparison this year's and last year's outturn results :—

Year and Táluka.	Estimate in annas.	Seed-rate per acre.	Outturn per Acre.		Value of produce.	Percentage incidence of assessment on the value of gross produce.
			Grain.	Straw.		
	As.	Lbs.	Lbs.	Lbs.	Rs. a. p.	
1891-92 (A'mod) ...	19	40	925	1,323	32 4 8	16·09
1892-93 (Broach) ...	16	41	995	1,405	30 14 7	12·77

The grain was worth 49$\frac{1}{4}$ lbs. per rupee this year as compared with 36$\frac{1}{2}$ lbs. last year.

Juvár (Exp. No. 36) this year gave better results than last year on almost similarly classed land. The anna estimate this year is, however, lower and is probably nearer correct than it was last year. The field has black soil with an admixture of *kankar* and bears an assessment of Rs. 3-12-5 per acre. Ten loads ordinary manure was applied before sowing. The field grows cotton and *juvár* in alternate years. The seed rate, 12 lbs. per acre, is exactly that of the formulæ,

The experimenter thinks that about two-third of the burden of assessment is assignable to cotton and, to make an accurate test, experiments should be made on the same field throughout the rotation. These might be vitiated by an exceptionally good or bad season. I tabulate the *juvár* outturn results of this and last year's experiments :—

Year and Táluka.	Estimate in annas.	Seed rate per acre,	Outturn per Acre.		Value of produce.	Percentage incidence of assessment on gross produce.
			Grain.	Straw.		
	As.	Lbs.	Lbs.	Lbs.	Rs. a. p.	
1891-92 (Jambusar) ...	20	8	792	796	17 13 4	20·68
1892-93 (A'mod) ...	16	12	886	1,184	33 7 8	11·27

The lowness of incidence is due mainly to difference in prices. The grain was this year reported worth 32¾ lbs. per rupee as compared with 54⅔ lbs. last year.

The field on which this officer's wheat test (No. 37) was taken bears a higher assessment than either of the two others. The acre rate is Rs. 4-10-8. The land is black with an admixture of *kankar* and grows cotton in rotation with either *juvár* or wheat. The field was this year fairly manured, eight loads ordinary manure being applied in June per acre. The cultivation was not as careful as it might have been. I tabulate outturn results of this year's and last year's crops for comparison :—

Year and Táluka.	Estimate in annas.	Seed-rate per acre.	Outturn per Acre.		Value of outturn.	Percentage incidence of assessment on gross value of produce.
			Grain.	Straw.		
	As.	Lbs.	Lbs.	Lbs.	Rs. a. p.	
1891-92 (Jambusar) ...	18	40	492	810	27 12 7	13·62
1892-93 (Amod) ...	14	41	523	705	24 3 1	19·28

The low prices this year tended to raise the incidence. The price of wheat last year was 20½ lbs. per rupee as compared with approximately 26 lbs. this year.

Mr. Phirozsháh Pestonji, District Deputy Collector,

Submits two very careful tests, a special and an ordinary one. Both are fully reported and are as valuable as any submitted this year.

The holding selected for the special test is representative of the inland as distinguished from the coast villages of Vágra táluka. The soil, though superior to that near the coast, is inferior to the rich cotton lands found more inland. The cultivation of the fields selected suffered because the owner is not an agriculturist by caste. The occupancy consists of two numbers with an aggregate area of 13¾ acres. The land has been assigned to the village barber for service at a nominal quit-rent of Rs. 16-10-0, but is assessed at Rs. 60-8-0. The barber's family consisted of three brothers and their wives. Two of the brothers have been dead some time and the third died a little time before the rabi crop harvest. The last brother with the assistance of one hired labourer managed the land latterly, but the fields did not get full justice. The hired labourer was paid Rs. 30 per annum and was lodged and boarded. The cost of his food is estimated at Rs. 3 per month or Rs. 36 per annum. No regular rotation of crops is practised. One number, which has gravelly soil and yet somewhat water-logged from its position, grows mostly wheat, *juvár* and *láng*, and these were the crops grown this year. The other field, the soil of which is superior, mostly

grows cotton rotated as usual with *juvár* or *láng*. Cotton was the crop grown this year. One pair of bullocks sufficed for the holding. A farm of this size would have provided full work for a pair of bullocks, if the tillage had been more careful. The cultivation is described as indifferent. No manure of any kind was applied to any of the crops. The season both for cotton and late crops was exceptionally good, and to this factor may be attributed the good yields obtained. Before I attempt to show the actual profits obtained I will particularize the results of each test.

The cotton (Exp. No. 38) grew on fairly good black land assessed at Rs. 4-9-7 per acre. The variety cultivated was *Deshi Baruchi kapás*. The crop was not even, and test areas to represent fairly the whole field were selected. Six pounds of seed per acre sown with a two-coulter drill in July produced a crop which yielded four pickings, the first in the fourth week of February, the last in the fourth week of March. The fourth picking was supervised by the Mámlatdár, all others by the experimenter. The fourth was insignificant compared with the others. The second picking was the important one. One test area yielded approximately 8§ lbs. seed cotton per guntha, the other 12⅛ lbs. per guntha. The average of the two shows an acre outturn of 438 lbs. worth Rs. 46-0-10. This yield represents a 14-anna outturn.

The *láng*, the wheat and the *juvár* which grew in the other field are each estimated as 14-anna crops. The soil locally called *morkankariát* is gravelly and low-lying and bears an assessment of Rs. 4-3-0 per acre. Its position makes it specially suitable for rabi crops in ordinary years. It grows occasionally cotton and sesame, but commonly the crops of this year. The cultivation is described as indifferent.

Fifty-four pounds per acre of *láng* (Exp. No. 39) sown with a two-coulter drill in October yielded a fair crop which ripened late in February. The outturn amounts to 803 lbs. pulse and 1,730 lbs. straw per acre, together worth Rs. 29-10-11.

Wheat (Exp. No. 40) with a slightly higher seed rate (60 lbs. per acre) drilled at the same time gave slightly better results. The wheat ripened in March and produced 762 lbs. grain and 1,170 lbs. straw, together worth Rs. 32-9-0. The variety grown, though called *potia*, was decidedly mixed.

Juvár (Exp. No. 41) did not yield so satisfactorily. It gave 585 lbs. grain and 810 lbs. *kadbi* per acre. The gross value of acre outturn amounts to Rs. 19-3-11. Through want of watching both the *juvár* and wheat were considerably damaged by birds.

The incidence of assessment works out rather high on all the three tests. The percentages are respectively 14·10, 12·85, and 21·75. The incidence of the cotton test is lighter, *viz.* 9·92 per cent. This indicates the truth of a widespread belief that cotton is the rent paying crop of Broach.

I epitomize below the value of gross produce from each crop :—

	A. g.		Rs. a. p.		Rs. a. p.
Cotton	6 38	worth	...46 1 7	per acre	320 6 3
Láng	4 23	„	...29 10 11	„	135 12 9
Wheat	1 21	„	...32 9 0	„	49 10 6
Juvár	0 28	„	...19 3 11	„	13 7 6
	13 30		Total value of produce...		519 5 0

In summarizing the cost of tillage operations for each field, it has to be noticed that hired labour is only charged for at 2½ annas for a man and 1½ anna for a woman per day. These are rather low rates. It is doubtful whether hired labour can be got at busy seasons so cheaply. The experimenter shows separately the cost of keeping a pair of bullocks for a year. I adopt his figures, although ordinarily they could be kept at less cost. The quantity of food and fodder consumed must have provided an exceedingly liberal ration. No value is put in for manure produced.

Cost of cultivation of Cotton field (6 acres 38 gunthas).
Seed and manual labour only charged for.

Operation.	Cost. Rs. a. p.
(1) One ploughing after rains; 1 man with 1 pair of bullocks plough an acre per day; 1 man 7 days at 2½ annas per day	1 1 6
(2) Four harrowings; 1 man and a pair of bullocks harrow 2 acres per day; 1 man 3½ days at 2½ annas per day	2 3 0
(3) Seed 40 sers	1 0 0
(4) Sowing; 1 pair of bullocks and 2 attendants drill the field in 3 days; 2 men 3 days at 2½ annas per day	0 15 0
(5) Covering seed; 1 man and a pair of bullocks working harrow 3 days; 1 man 3 days at 2½ annas per day	0 7 6
(6) Hand-weeding twice; 6 women, 2 days, each time; 36 women for 1 day at 1½ annas per day	3 6 0
(7) Watching; 1 man 2 months	4 0 0
(8) Picking; contract rate in district is 2½ annas per maund of 40 sers. Picking at the above rate cost	11 9 7
(9) Cost of marketing is shown separately under cost of bullocks and wages of hired attendant	...
Total ...	24 10 7

Cost of cultivation of Láng, Wheat and Juvár field (6 acres 32 gunthas).
Seed and manual labour only charged for.

Operation.			Cost. Rs. a. p.
(1) Once ploughing after 1st fall of rain; 1 man and a pair of bullocks ploughed the field in 7 days; 1 man 7 days at 2½ annas per day			1 1 6
(2) Harrowing 4 times during rains; 1 man and a pair of bullocks harrowed field each time in 3 days; 1 man 12 days at 2½ annas per day ...			1 14 0
(3) Seed—	Rs. a. p.		
Wheat, 90 sers at Rs. 2-8-0 per 40 sers ...	... 5 10 0		
Láng, 6 maunds at Re. 1-4-0 per 40 sers ...	... 7 8 0		
Juvár, 7 sers	... 0 4 0		
			13 6 0
(4) Sowing; 1 seed drill and 2 attendants drilled field in 3 days; 2 men 3 days at 2½ annas each per day			0 15 0
(5) Covering seed; 1 man with 2 bullocks covered seed by harrowing the field in 3 days; 1 man 3 days at 2½ annas per day			0 7 6
(6) Weeding twice; 6 women each time 2 days; 12 women 2 days at 1½ anna each per day			2 4 0
(7) Harvesting—	Rs. a. p.		
Wheat—paid in kind; 5 sheaves per hundred or 20 per cent. of gross produce; this for field equals	... 2 7 9		
Láng—a labourer at 2½ annas does a bigha per day; the cost therefore for the field was	... 1 6 10		
Juvár—the same rate prevails for juvár and the cost of harvesting the crop was	... 0 3 9		
			4 2 4
(8) Threshing; the threshing of the three crops was done in two days by 8 hired men and 12 borrowed bullocks. The borrowed bullocks were fed at a cost of 2 annas each per day; the men were paid at the rate of 2½ annas per day			5 8 0
(9) Winnowing; 1 man winnowing, 1 man supplying winnower, 1 man sweeping chaff from grain, as it falls to ground; 3 men for 5 days at 2½ annas each per day			2 5 6
(10) Cost of carting from field to threshing floor and thence to market included in charge made separately for cost of keep of bullocks and wages of attendant			...
Total ...			31 15 10

Cost of keep of two bullocks for a year.

	Rs.	a.	p.
Juvár *kadbi* 1,500 bundles at Rs. 2 per 100	30	0	0
Hay 500 bundles at Rs. 2-12-0 per 100	12	8	0
Láng *gotar* (Bhusa) 10 *kalsis* at Rs. 5 per *kalsi*	50	0	0
Wheat *gotar* (Bhusa) 6 *kalsis* at Rs. 2 per *kalsi*... ...	12	0	0
Cutting grass, &c., on waste ground...	12	0	0
Amount paid for green juvár fodder, 2 acres	24	0	0
Total ...	140	8	0

The cultivator invested Rs. 60 in implements and Rs. 120 for a pair of bullocks. Interest and depreciation would be fairly met by Rs. 25 per annum.

The servant boarded by the cultivator is paid Rs. 30 per annum and his board cost Rs. 36. I put the cost of board against work performed other than that included in cost of tillage operations. Irrespective of household expenses the balance sheet for the year stands thus :—

	Rs.	a.	p.	Rs.	a.	p.
Gross value of produce				519	5	0
Contra—						
Cost of cotton cultivation as per statement given above	24	10	7			
Cost of wheat, láng and juvár cultivation as per statement given above	31	15	10			
Keep of a pair of bullocks for a year ...	140	8	0			
Interest on and depreciation of invested capital in live and dead stock	25	0	0			
Board of hired labourer	36	0	0			
Assessment	60	8	0			
Local Fund Cess ... — ...	3	12	6			
				322	6	11
Profit ...				196	14	1

If the quit-rent (Rs. 16-10-0) instead of the assessment be charged the profit would be increased. The profit in any case is high. The outlay figures have no pretension to accuracy. They may be approximate. The experimenter remarks that there were two factors which favoured the occupant, *viz.*, an excellent season and a high price for cotton.

This officer's ordinary experiment (No. 42) was carried out in Páldi, a coast village of the Vágra táluka. The field selected has medium black soil of medium depth and bears an assessment of Rs. 3-15-4 per acre. It measures 7 acres 23 gunthas and is owned by a Koli who cultivates altogether about 25 acres and is fairly well-to-do. The field selected grew a crop which was considered average of the other fields of the village, barring those which, owing to the poverty or indolence of the owners, gave poor crops. Two acres of the field received a liberal application of manure (20 loads per acre). It is not clear whether the test area was taken in the part of the field which had been manured or not. The experimenter remarks that the crop was even all over, which would indicate that the manure had little or no effect. This may be quite true, for seldom does manure applied to a *dry* rabi crop show any appreciable effect on black soil. The manure was not applied directly for the wheat. It was the intention to grow cotton this year. The cotton had been sown but heavy rains swamped the field and destroyed the seedlings. The field grows wheat or *juvár* in rotation with cotton, and the owner finds sufficient manure for two acres every year. This year 40 loads were applied, of which 30 were of home production. For carting manure for a neighbour the cultivator was paid in kind, receiving ten loads of manure in lieu of wages. He had taken great pains with his field. It had been carefully tilled and well weeded. The wheat crop must have benefited considerably by the tillage preparation for the cotton crop. The experimenter reports that a lower seed rate is required for wheat sown in the coast fields than more inland. The wheat was drilled in November. *Hánsia* was the variety grown. Forty one pounds seed per acre is the reported seed rate. The crop ripened towards the end of March and yielded

841 lbs. grain and 1,010 lbs. straw per acre. This was considered a 16-anna outturn. The incidence works out 11·27 per cent.

Surat.

Mr. Weir could conduct only one experiment owing to his absence on privilege leave during the kharif harvest. Mr. Kotvál did not carry out a rice test being busy with the jamábandi work. Mr. Leggatt submitted the required number.

Mr. J. W. A. Weir, Assistant Collector,

Submits a crop experiment (No. 43) on castor oil seed (*diveli*). He had difficulty in finding a field in his charge under castors as a sole crop. The crop tested was a catch-crop grown in a low lying portion of a field where cotton failed because it was destroyed by flood water. The rest of the field was under cotton and usually that crop is rotated with *juvár* or with *juvár* and subordinate pulses. The field measures 7 acres 8 gunthas. Part of it (4 acres 15 gunthas) is rented by a Koli for Rs. 50 per annum. No manure has been applied to the field for some years. The field has light brown *gorát* soil assessed at Rs. 3-8-8 per acre. The seed was sown in October through a seed tube attached to an ordinary plough (*orni*). Fourteen pounds per acre is the reported seed rate. This I think is nearly average for castors as a sole crop, and is much nearer the mark than the seed rates reported for this crop in the last two crop experiment reports. The crop was ripe at the end of March and yielded 415 lbs. oil-seed per acre.

The experimenter had the oil extracted from the seeds by a professional *ghánchi*, but the results compare very unfavourably with those similarly obtained and reported on page 7 of last year's report. Mr. Weir states that the weight results of products were in excess of the weight of seed used, and explains this by noting that the *ghánchis* invariably soak the seeds in hot water for ten minutes before they proceed to extract the oil. The absorption of water by the seed would add weight to the *khol* but could not add weight to the purified oil. Although not distinctly stated, it is apparently clear that the whole produce from 8 gunthas, *i.e.*, 83 lbs. seed, was given. The result is shown thus :—

	Weight.	Value.
	Lbs. tolas.	Rs. a. p.
Oil	28 8¾	4 1 6
Khol	56 36	0 12 0
Total ...	85 5¾	4 13 6

showing an excess of 2 lbs. 5 tolas due to water used.

From the above data Mr. Weir calculates the acre outturn thus :—

Produce.	Weight per acre.	Value per acre.
	Lbs. tolas.	Rs. a. p.
Oil	141 4¾	20 7 6
Khol	284 24	3 12 0
	Total ...	24 3 6

This leaves a margin of profit per acre for manufacture of nearly Rs. 4.

Mr. E. H. E. Leggatt, Assistant Collector,

Submits three crop test reports which are meagre in details. An experiment on *vál* (No. 44) as second crop on a highly assessed rice field gave an exceedingly high yield, *viz.*, 1,046 lbs. pulse and 2,950 lbs. straw per acre. This

crop is much underestimated at 10 annas, and the season though described as indifferent must have been more than ordinarily favourable.

Two castor tests (Nos. 45 and 46) by this officer give each poor results. The fields have each black soil and respectively bear an assessment of annas 15 and Re. 1-1-1 per acre. The higher assessed field gave the worst yield. The crops tested were the sole crops of the year.

Mr. Anna Gopál Kotvál, District Deputy Collector,

Sends two tests; the first on coarse *májarvel* rice, the second on *hánsia* wheat. The rice (Exp. No. 47) was grown from seedlings transplanted in August rather late in the season. The seed rate 112 lbs. per acre is so high that I think the information inaccurate. The experimenter explains that the quantity of seed reported was advanced by the Patel of the village and sown on a three-guntha seed-bed. The seedlings were sufficient for an acre of transplantation. I think the area of the seed-bed must have been more than three gunthas and that probably a proportion of the seedlings was sold. This is a common practice. In any case no experienced cultivator would sow 112 lbs. of seed on a three-guntha seed-bed. Continuous heavy rain throughout the monsoon was favourable to rice grown on *gorádu* soil. The field was liberally manured. It is reported that 18 cart-loads of cowdung and 540 lbs. of castor-cake were applied per acre before transplantation. The crop estimated at 16 annas was ripe on the 19th November and produced 2,267 lbs. grain and 2,609 lbs. of straw. The gross value of outturn amounts to Rs. 46-6-6. The field bears an assessment of Rs. 11-9-0 per acre. No second crop was grown. Under the exceptionally favourable seasonal circumstances of the year, I see no reason why a second crop was not taken. The burden of assessment on the rain crop is high. The incidence works out 24·91 per cent.

The seed rate of the wheat crop experimented upon (No. 48) by this officer is nearer correct. Seventy-six lbs. per acre for a dry crop is not much over average. The 8-anna valuation for an outturn of 624 lbs. of grain is, I think, rather low. The by-product is reported at 427 lbs. per acre. I fail to understand how that weight of straw could have produced the reported weight of grain. The field has black soil assessed at Rs. 4-3-0 per acre. It usually grows cotton in rotation with *juvár*. 20 cart-loads per acre of ordinary manure were applied for the wheat crop. The cultivation was good. The seed was drilled in November and the crop ripened in February.

Thaʹna.

Messrs. Deshmukh and Patvardhan submitted three tests each from this district. Mr. Brown omitted to experiment owing to ill-health; and Mr. Pratt was reported to have been engaged in making a sugarcane experiment; but he soon proceeded on leave and his report never reached this office. Mr. Deshmukh's tests are said to have been apparently prepared from notes left by Mr. Mirza Abbás Ali Baig.

Mr. L. G. Deshmukh, Assistant Collector,

Sends three tests which are not altogether satisfactory. The test area of the first experiment is below the prescribed minimum. This officer's method of determining seed rates is original. The plants growing on a guntha patch were actually counted. An equal number of seeds of the respective crops were weighed against rupees or tolas, and this weight multiplied by forty gave the weight of seed necessary for an acre. Mr. Deshmukh is surprised that the cultivator's estimate is just four times as much. He need not be; for it is well known that if seeds are carefully dibbled into a well prepared seed-bed, one-eighth of the usual quantity sown will often suffice. In ordinary sowing, allowances have to be made for contingencies; some of the seed has lost vitality; seeds deposited too deeply or near the surface may not germinate at all; and a good many are eaten by birds or by insects. I prefer to accept the cultivator's estimate in each case as the more accurate.

Gram as a second crop after rice (Exp. No. 49) gave on a field assessed at Rs. 4-13-0 per acre fairly satisfactory results. The moisture left in the soil after the rice was reaped was sufficient for the gram, but the crop suffered from

unseasonable rain which induced insect-attack. The sample ser of gram sent to my office weighed 2 tolas more than the weight reported by the experimenter. There was only a small area of gram left unharvested in the village when the test was taken, and on the faith of hearsay evidence the crop was taken as average. The seed was broadcasted in December and the crop ripened in March. The seed rate (13 lbs. per acre) is absurdly low. The outturn, 485 lbs. pulse, classes in local opinion the crop as a 20-anna one. The percentage incidence works out 29·61. This for an average second crop is perhaps a trifle high.

Mr. Deshmukh did not make a good selection for his second test (No. 50). Safflower subordinate to *vál* is rarely grown. This oil-seed does not usually occupy more than one or two acres in the whole Thána district. The field experimented upon appears to grow a mixed crop of *vál* and safflower as the sole crop every year. The soil is called locally *káli chikanvat*. It bears an assessment of Re. 1-6-11 per acre. The *vál* was attacked by caterpillars. The season was specially favourable otherwise. The yield of *vál* amounted to 279 lbs. pulse estimated at 13 annas and of safflower 141 lbs. oil-seed estimated at 20 annas. The field was not manured, but was otherwise well cultivated.

On a rice field bearing the same local name assessed at Rs. 3-14-9 per acre *vál* (Exp. No. 51) as a second crop after rice yielded well. The seed rate is again absurdly low. The seed was broadcasted. This crop was also attacked with caterpillars. The field only grows second crops in favourable season. The sample ser of *vál* weighed in my office 2½ tolas more than the weight reported. This difference as well as that referred to in respect of gram can only be explained by inaccuracy. The experimenter says he found differences of a few tolas by different forms of the same local ser. A measure having a diameter of 5 inches gave a few tolas more than a measure with a diameter of 3 inches. The measure in each case is heaped measure, and the heap on a broader base is larger than on a narrower one.

The yield estimated as a 20-anna outturn amounts to 636 lbs. of pulse and 800 lbs. of straw. The weight of by-product, in each of Mr. Deshmukh's experiments, is shown in round figures. These figures I suspect show probably approximate estimates rather than true weights.

Mr. V. R. Patvardhan, District Deputy Collector,

Sends two tests on gram and one on *vál*. The gram experiments give exceptionally good results, the season being most favourable. Each field is classed as rice land, but the second field tested lies so low that it is submerged during the rains and holds too much water even for rice. On this field gram is grown every year as a rabi crop. On the other field gram is grown as a second crop after rice every year. Each field has a medium black soil. The field that usually grows rice bears the higher assessment. The respective rates for each are Rs. 2-0-6 and Re. 1-7-5 per acre. No manure was applied to either field this year. The seed was broadcasted in each field about the middle of November. The seed rates are, I think, much overestimated at 88 lbs. and 86 lbs. per acre. The by-product was not valued. The outturn results are tabulated below :—

Experiment.	Anna estimate.	Yield per acre of pulse.	Value of pulse per acre.
	As.	Lbs.	Rs.
First field, second crop after rice (Exp. No. 52)..	16	886	30
Second field, sole crop of the year (Exp. No. 53).	14	699	24

This officer's *vál* test (No. 54) would have given better results, had the crop not suffered from insect attack. The field experimented upon is rice land and bears an assessment of Rs. 3-13-9 per acre. *Vál* is grown as a second crop in years when there is sufficient moisture in the soil after the rice is reaped. This year there was ample. The outturn estimated at 16 annas amounts to 455 lbs. pulse and 752 lbs. of chaff or useful by-product. The stems which are useless as fodder weighed 784 lbs. per acre.

CENTRAL DIVISION.

Kha'ndesh.

None of the Assistants in this district were able to conduct crop experiments owing to (1) frequent changes in the personnel, (2) exigencies of tour, and (3) engagement on other duties. The experiments forwarded by the Deputy Collectors have been rejected for reasons noted below. Mr. P. R. Mehta, Superintendent, Bhadgaon Farm, explains that he failed to carry out crop tests as directed owing to partial failure of kharif crops near the Government Farm and owing to his absence in Gujarát during rabi harvest. This explanation is not quite satisfactory.

Mr. S. B. Chitgubi, District Deputy Collector.

This officer reports what he calls four ordinary experiments, but which are only two. Two fields under wheat were selected and two test areas were measured in each field. Both fields are in the occupation of one man who also cultivates four other numbers. The entire holding measures 59 acres 39 gunthas and bears an assessment (original survey) of Rs. 157. The test areas are unnecessarily large. They measure in the aggregate 1 acre 20 gunthas. The experimenter reports that the experiments were conducted all in one day. If such was the case I fail to see how they received the close personal supervision which standing orders demand. Two samples (each the contents of a two-ser measure,) were forwarded to my office. One of which gave 149 tolas and the other 142 tolas per local ser. The grain of the former was plump and good, that of the latter shrivelled and not so good. This accounts for the difference in weight. Yet the experimenter treats the produce from each field as of the same weight per ser under a mistaken supposition that the contents of a ser must always weigh the same, however much the grain may differ in quality. This vitiates results, and I cannot therefore report the outturn figures of the experiments. But the experimenter gives other information which may be put on record. One of the fields has black soil, the other light black (*halki káli*). *Bakshi* wheat was grown on each field. The seed (45 lbs. per acre) was sown on the 13th to 19th October; the crop was ripe on the 18th February. A heavy two-coulter drill was used for sowing. The fields were only once ploughed and were manured lightly with ordinary farm-yard manure and also by folding sheep. Cotton and *jowári* are the staple crops, but rabi crops of wheat and gram are occasionally taken.

Mr. Kázi Kamruddin, District Deputy Collector.

Two experiments reported by this officer are of little value. *Jowári* in each case was tested. It was the principal crop of a mixture. The experimenter does not say whether the subordinate crops were good, bad or indifferent. These in one field are reported to have been kidney bean and hemp (? probably *ámbádi*) and in the other field kidney bean and pigeon pea. The first field has medium black soil assessed at Re. 1-12-3 per acre. Twenty-four cart-loads of ordinary manure were applied per acre before sowing. The second field assessed at Re. 1-3-8 has shallow black soil overlying a substratum of white earth. This field is never manured. It is stated that it was twice cropped each year during the last three years, but it is impossible that the rotation reported could have been practised. Neither wheat nor *jowári* could possibly be a second crop after cotton on such land. The sample sers of grain taken from each field's produce, are recorded as weighing 144 and 126 tolas. The weights found in my office were respectively 133 and 127½ tolas. The outturn of the first field was 1,595 lbs. grain and 232 bundles *kadbi* per acre, that of the second field 465 lbs. grain and 264 bundles *kadbi* per acre. I have considerable doubt regarding the accuracy of these figures, and as at the best they only show approximately the outturns of principal crops (the values of subordinate crops being unknown quantities) I am unable to report them in the tabulated statement.

Na'sik.

The following experiments were received from this district :—

	No. of Tests.
Mr. L. G. Deshmukh	1 ordinary.
Mr. R. B. Stewart	1 ordinary. and 1 special.
Mr. H. W. Hayward	1 ordinary.
Mr. C. M. Thatte	3 ordinary.

The Collector had asked each of his Assistants to make 3 ordinary experiments and one special experiment in addition. He writes : "The programme as settled in the beginning was not carried out in its entirety by any officer, and the reasons assigned for not complying with the orders issued are not quite satisfactory except in the case of Mr. Hayward."

Mr. L. G. Deshmukh, Assistant Collector,

Conducted two crop experiments and has reported one. A test on *khurásni* gave an outturn so poor that the experimenter considered it inadvisable to report results. *Bájri* forms the subject of the reported test (No. 55). This millet is the staple crop of the district. The remark is made that the heavy monsoon was unfavourable to the crop. The results do not show that such was the case. It must, however, be admitted that generally throughout the Presidency the *bájri* crop was poor owing to an unseasonable rainfall. Heavy rains, when the crop was in flower spoiled the bloom and prevented fertilization, so the grain heads were only partially filled. The field tested has middling black land assessed at Re. 1 per acre. *Bájri* is rotated with groundnut. This rotation indicates a higher standard of fertility than ordinary. The field was lightly manured before sowing, with four loads ordinary manure per acre. The seed (5 lbs. per acre) was drilled in July and the crop ripened early in November. The produce 910 lbs. grain and 2,352 lbs. chaff and straw per acre, classes the crop according to the formulæ at more than the maximum standard, but is locally estimated as that of an average crop. The incidence of assessment is decidedly light. There is a difference of 5 tolas in the weight of sample measure of grain as found by experimenter and in my office. This makes the accuracy of reported figures somewhat doubtful.

Mr. R. B. Stewart, Assistant Collector,

Reports two experiments, one on wheat, the other on cotton. The latter is treated by Mr. Stewart as a special experiment, but it can hardly be accepted as such. The registered owner of the field experimented upon occupies three numbers. *Bájri* occupied two fields (15 acres 30 gunthas) with an assessment of Rs. 9-0-0. Cotton occupied one field (5 acres) bearing assessment Rs. 6-2-4. The result of the cotton test indicates that that crop was a fair average one ; but owing to heavy late rain the *bájri* crops were destroyed entirely and would not yield sufficient grain to pay for harvesting. I cannot consider the holding a representative one ; for more than $\frac{3}{4}$ths of the area cultivated produced nothing and this cannot be average for the district. In fact, barring a famine year, the result may be considered the worst that could happen in an unfavourable season. Mr. Stewart's information is full, and it is possible to show from his figures approximately what the financial results were, but before doing so it is necessary to first show the results of the cotton experiment.

The field (Exp. No. 56) has black soil on which *bájri* rotates with *varádi* cotton ; no manure was applied this year, but the cultivation is described as good. The rainfall was too much for the cotton, but the outturn is, I think, underestimated at 8 annas. The crop was only picked once and was probably overripe at the time. Otherwise unripe bolls must have matured later in which case the cultivator would not immediately after the first picking have turned his cattle into the field as he did. The seed was drilled in the ordinary way by two women following a two-coulter drill and feeding the seed through tubes guided along the coulter furrows. The seed rate $6\frac{3}{8}$ lbs. is low and is probably inaccurately stated. The seed for 5 acres at the above rate of sowing would have cost 7 annas. It was borrowed, on the condition (as stated by the experimenter) that from the produce of the crop, 1 maund of seed cotton worth Rs. 5-8-0, would be given in

payment. The cultivator would hardly have agreed to pay such an exorbitant price and probably a larger quantity of seed was borrowed for sowing than what is reported. The seed was sown in June and the cotton was picked on 22nd November. Meantime the crop was bullock-hoed once and hand-weeded twice. The outturn (310 lbs. of seed cotton per acre) would represent a full average outturn if the formula or the Bhadgaon Farm results are any guide to the general results from black land.

The gross returns are valued at Rs. 20-12-6 per acre or Rs. 103-14-6 for whole field. Mr. Stewart has estimated the cost of cultivation and brings it for the field exclusive of assessment to Rs. 65-15-0, which leaves a balance profit on the whole crop of Rs. 38. Mr. Stewart's estimate is not quite accurate. Excepting cost of sowing all other items are nearly right. As regards cost of sowing and covering the seed, it is said that two seed drills each drawn by two bullocks guided by one man and followed by two women (sowing the seed) took five days to sow five acres, and that two harrows took the same time to cover the seed. It would have been nearer the mark to say that the field (5 acres) was sown in 2½ days by one seed drill and the seed covered by one harrow in the same time. The cost of sowing and of covering the seed may, therefore, be reduced from Rs. 6-14-0 to Rs. 1-11-6. This would increase the profit to Rs. 43; but it is not of so much importance to know precisely the difference between cost of cultivation and value of outturn as to know exactly what cash expenditure has been incurred for hired labour, &c. The following payments appear to have been made :—

	Rs.	a.	p.
Sowing; 4 women, 5 days...	2	8	0
Weeding; 2 men, 15 days	5	10	0
Gathering cotton	12	0	0
Haks (village dues)	7	0	0
Repayment for borrowed seed	5	8	0
	32	10	0

It has been noted already that the *bájri* crop failed completely. Excepting household labour no expenditure was, however, incurred on the *bájri* except for seed (Rs. 5). Deducting home labour the financial results of cultivating 20 acres 30 gunthas are as under :—

5 acres of cotton gave a gross outturn worth Rs. 103-14-6.

Deduct—

	Rs.	a.	p.	
(*a*) Expenditure in cash or kind on cotton crop	32	10	0	
(*b*) Seed for bájri	5	0	0	
(*c*) Cotton seed for work-cattle during 4 months hard work ...	13	0	0	
(*d*) Assessment of holding and Local Cess	16	1	4	
				66 11 4
Cash available to meet household and other expenditure ...				37 3 2

The occupant was assisted by a brother-in-law who was to have a share of the produce but who only worked three months and then left when he found the outlook unpromising. He received his board for the work he did. The occupant supports an aged father and has two wives. When he found his own *bájri* crop a failure he with his wives did harvest work for other cultivators for two months and probably earned as wages in that time about Rs. 18. The occupant has four work-cattle, two milk buffaloes, 2 cows and 1 pony. He had no fodder in store for his cattle and expected to borrow money to buy fodder. Ordinarily the income from sale of ghi and milk is Rs. 20 per annum, besides sufficient for home consumption is provided. It said that the food for the pony costs Rs. 45, the buffaloes Rs. 66, and cows Rs. 14 per annum. If the pony costs Rs. 45, why is it kept? As regards the milk cattle we may take it that they are ordinarily maintained at a profit and during the present unfavourable season they were either starved or if fodder was bought at least an equivalent return was got in milk.

The occupant married a second wife two years since and then contracted a debt of Rs. 300. Mr. Stewart states that as the occupant estimates the expenses of a man "at Rs. 4 per month for food and a woman at Rs. 3½ with Rs. 7 worth of clothing for each per year, it will be seen that his holding will not nearly support his household this year." I think that it would be more correct to say that the cultivator has been able to make from his holding in a most unfavourable year about Rs. 40 in cash and by outside labour Rs. 18, which would, if strict economy was practised, be sufficient to meet all household expenses, and if he had been provident in more favourable years, he should have had enough fodder in stock and cash in hand to prevent his getting deeper into debt.

Mr. Stewart sends a wheat test (No. 57) with details rather meagrely reported. The field grows wheat alternately with sesamum and occasionally *bájri*. The land is black and is assessed at Re. 1-2-5 per acre. The yield (616 lbs. grain per acre) is according to the formulæ nearly correctly estimated at 15 annas. The straw and chaff from 8 gunthas filled 4 bags. It was not weighed and is considerably undervalued at 10 annas per acre. 32¾ lbs. seed per acre was drilled with a heavy two-coulter drill in November and the crop was ripe in February. The season was favourable, the cultivation good and manure was last applied two years since. The gross value of outturn comes to Rs. 21-10-3 per acre. No remark is made regarding the healthiness of the crop. In almost all districts rust did more or less harm.

Mr. H. W. Hayward, Assistant Collector,

Sends a wheat test (No. 58). The report would have been more interesting if fuller information had been given. In some respects I think the information must be faulty. For instance, it is highly improbable that 50 cart-loads per acre of manure could have been applied even for an irrigated wheat crop. The crop grew on black land commanded by a four-*môt* well. Inclusive of water rate the assessment is Rs. 2-15-7 per acre. Unlike other crops of the district this crop was not harmed by rust. *Pivla* was the variety grown. The field was well prepared (five times ploughed). The seed 32 lbs. per acre (rather a low rate for an irrigated crop) was drilled first lengthwise and then across the field. This practice, which is common, secures even distribution of seed. Dry-crop wheat is not drilled in this way on black land, because a heavy two-coulter drill is used to deposit the seed deep enough to secure moisture sufficient for germination and this can only be done if the coulters are rather wide apart. The seed was drilled in October. The crop ripened 4½ to 5 months afterwards. It was estimated to be a 16-anna one and yielded 678 lbs. grain and 1,196 lbs. straw and chaff. The gross acre value of produce is Rs. 32-9-1. The incidence of assessment is moderate; it works out 9·13 per cent. If the quality of the land is fairly gauged by the rate of assessment, and if we take into consideration the effect of irrigation, then I should say the yield is more like that of a 12-anna than of a 16-anna standard; the extent of irrigation is not noted.

Mr. C. M. Thatte, District Deputy Collector,

Sends three tests, the first on *bájri*, the second on wheat, and the third on onions. The *bájri* test is, I think, unreliable. The market rate of the grain is quoted at 19 lbs. 15 tolas per rupee. This rate is so suspiciously high that I cannot accept it as accurate. The contents of the measure ser are said to have weighed 54 tolas. I think this must be the weight of the contents of a half ser measure, as a sample received in my office weighed 109 tolas. Another officer in this district (Mr. Deshmukh) reports *bájri* worth 46 lbs. per rupee. On reference the experimenter has failed to explain the high price of the grain, and I cannot, therefore, report the experiment.

No suspicion of inaccuracy attaches to Mr. Thatte's wheat test. The experiment (No. 59) was made on an indifferently cultivated crop which was affected by blight (probably rust) and grown on red *barad* land assessed at Re. 1-4-9 per acre. The field grows wheat and *bájri* alternately. No manure was applied this year. 254 lbs. of grain per acre, which with the straw is valued at Rs. 10-11-9 per acre is held to be an 8-anna outturn. 50⅓ lbs. seed per acre is a higher seed rate than that of the formulæ, but the quantity sown would neces-

sarily be required for light land. The grain grown weighed 60¼ lbs. per bushel and was worth about 25 lbs. per rupee.

Mr. Thatte reports an onion test (No. 60) which affords information of interest and value. The results of this and other experiments on the crop prove that the formulæ estimates of outturn have been based on wrong data. The crop tested was liberally managed. The field consists of black soil and is only in part irrigable. That which is *bágáyat* bears a special water rate of Rs. 2 for 2 acres 15 gunthas, which added to the dry-crop rate brings the assessment of this part of he field to Rs. 2-7-11 per acre. The crop as is usual was grown from transplanted seedlings. The proportionate area of seed-bed to that of transplantation is not given; nor is the seed rate clear because recorded in sers instead of in lbs. It is stated that 12 sers of seed was required for an acre of transplantation. This is more than the actual quantity needed. But it may have been used, because onion seed deteriorates rapidly, and allowance must be made for non-germination of a considerable proportion of the seed used. Onion seed will not keep good for a year. Consequently large onions are usually planted so that they mature their seed in April or May, and this seed is sown in seed-beds in the following August or September for the main crop. Each bulb is cut transversely before planting and only the bottom section planted. The effect is that many shoots spring from one bulb. The field tested grew groundnut in 1890-91, sugarcane in 1891-92, and onions in 1892-93. The cultivator shows a due appreciation of the value of rotation and also of green manure. Bombay hemp (*san*), Crotolaria juncia, sown in the rains, was grown specially to be ploughed in in August. It must have left the soil free and open and in the best possible condition for onions which were transplanted in September. The seed was sown in a nursery in August. The experimenter does not describe the manner of transplantation. It is usual to cut off about ⅓ of the leaf end from the seedling before it is transplanted. The extent of irrigation is not reported, nor is the cost of irrigation included by the experimenter in a memorandum intended to show the cost of growing the crop. In other respects also the figures of this memorandum are inaccurate and are, therefore, not reported. A top-dressing of cowdung ashes, said to have been at the rate of 20 loads per acre, was applied in October. It is questionable whether the cultivator intended that this should be valuable only on account of its manurial value. A top-dressing of ashes is commonly given to onions, and the effect is more a preventive one against insect attack (especially against grubs) than as manure. The crop was ripe on the 24th of March and produced 12,923 lbs. of marketable bulbs per acre, worth Rs. 131-4-0. The test is interesting, but fuller information would have been valuable, as there is little on record yet regarding this and other important garden crops.

Ahmadnagar.

Messrs. Padamji and Vádekar forwarded one special test each; these, however, had to be treated as ordinary owing to shortcomings noted further on. Mr. Gibb was prevented from undertaking a third test, and the reasons adduced by him are deemed satisfactory by the Collector. Mr. Young, Divisional Inspector, Land Records and Agriculture, Central Division, carried out the three tests required of him in this district and his reports are valuable.

Mr. M. C. Gibb, Assistant Collector,

Submits two tests, both on wheat, the first on dry-crop *dáulkháni*, the second on irrigated *bakshi*.

The soil of the field selected for the first experiment (No. 61) is about average for the táluka, but inferior to that of fields on the banks of the Godávari. This field is part of the Mhárs' *inám* and is cultivated by a Máli on the half produce system. The Mhárs pay no judi. The field has black soil assessed at Re. 1-1-7 per acre, and on it *bájri* is grown alternately with mixed wheat and safflower. This year the safflower sparingly sown was not tested. The wheat yielded well. The seed was first sown in September, but heavy rain washed away the first sowing, and the field had to be re-sown in October, somewhat late for safflower. Presumably this was the reason why the oil-seed seed rate was less than usual. No manure was applied. The use of manure for dry-crop wheat on black land is, however, exceptional. The season for wheat was favourable and

the cultivation is described as good. The seed required for the two sowings was 78 lbs. per acre. This gives a seed rate for each sowing of 39 lbs. per acre, which for a dry crop on black land is about average. The outturn estimated locally at the average standard amounts to 795 lbs. grain per acre. There is some doubt as to the accuracy of the experimenter's figures. He reports the weight of contents of a measure ser to be 122½ tolas, whereas his outturn calculations are based upon the weight being 102½ tolas. I believe the latter weight to be nearly correct as it was approximately the weight of sample forwarded to my office. Mr. Gibb says that the cultivator would sell to the dealer the grain produce at 12 sers or 31$\frac{7}{13}$ lbs. per rupee, whilst the dealer in his turn would sell at 8 sers or 21 lbs. per rupee. Wheat is very dear this year, and I think 31$\frac{7}{13}$ lbs. per rupee a cheaper rate than what is generally current. At that moderate rate the gross value of outturn comes to Rs. 27-11-9.

Irrigated *bakshi* wheat as a second crop (Exp. No. 62) after *bájri* did not yield nearly so well. The reason is to be found in the fact that although valued as an average crop for the village it was not more than a 10-anna crop for the táluka. Moreover, some damage had been done by rats but not nearly to such an extent as in many other fields in the Nagar and Párner tálukas. The field carries usually two crops every year, *bájri* being invariably the rain crop. Sometimes, it is followed by gram, sometimes by wheat. Occasionally it is the sole crop of the year. The *bájri* crop was this year heavily manured. I think the information given regarding the quantity applied is inaccurate. The field is not small and it is not at all likely that the cultivator could, as reported, afford to apply 50 loads per acre. The field is irrigated by *pát*. It has black soil and bears an assessment (soil and water combined) of Rs. 2-8-0 per acre. The seed rate was 64 lbs. (about average for an irrigated crop) and the outturn of grain was 413 lbs. per acre. The seed was drilled in November, and the crop ripened in March. The gross value of produce amounts to Rs. 22-8-0 per acre. In this case the grain was reported worth about 21⅓ lbs. per rupee. The experimenter gives reasons to account for the difference in value of the grain of this and of the other crop tested, but the reasons are not conclusive. It may be true that irrigated *bakshi* grain is preferred to dry-crop grain and that the wheat of the táluka has a high reputation, but these facts do not account for the wide difference in value between two varieties of wheat. The shrivelled appearance of the *bakshi* sample sent to my office indicated that the produce of the field could not have commanded the highest market rates, and as the crop was irrigated it also indicated that rust had done considerable damage. Mr. Gibb's experiments are valuable although the information is not in every respect accurate.

Mr. Sorábji Padamji, Assistant Collector,

Submits a special test which I cannot report as such. The field experimented upon was not a good selection for a special experiment. The holding is sublet by the registered owner on the following terms. The occupant to pay assessment and local cess and ⅔rd seed and receive ⅔rd produce; the tenant to work the field, find ⅓rd seed and receive ⅓rd produce. The field has an area of 14 acres 29 gunthas, of which 9 acres 29 gunthas grew a rain crop of *bájri*. The remainder (5 acres) was sown with mixed wheat and safflower. On 5 acres of the part under *bájri*, a second crop of gram was taken. The areas under the respective crops are given in round figures. It is not at all likely that exactly 5 acres were respectively sown with wheat and with gram. The *bájri* was not experimented upon. The experimenter took the cultivator's statement regarding outturn of this crop; and on the strength of this being true, attempts to gauge the outturn from the whole holding by testing only the gram and wheat. I can only treat these tests as two simple experiments taken on different parts of the same field.

The field (Exp. No. 63) has good black soil assessed at Re. 1-10-9 per acre No manure has been applied during the last four years. The season was favourable and the tillage careful. The portion of the field under mixed wheat and safflower was twice ploughed and twice harrowed. The mixed seed was drilled with a three-coulter heavy drill (*moghad*) in October. The seed rate of wheat (24 lbs. per acre) is lower than usual for a dry-crop; that of safflower is not reported. The crop which ripened in March yielded 994 lbs. wheat and 72 lbs. oilseed per acre. This is estimated as a 12-anna outturn, but is probably nearer an average one. Mr. Padamji tested a similar mixed crop on similarly classed land in the same

táluka last year and the reported yield was so exceptionally high that there were doubts as to its accuracy. The results again this year are good, but they compare unfavourably with those of last year, but I think the outturn figures of this year are the more reliable of the two. The burden of assessment is undoubtedly light.

Gram (Exp. No. 64) grown on another portion of the field hardly got a fair chance. The preparatory tillage was not sufficient; neither was the seed rate. The gram followed *bájri* and the seed (19·6 lbs. per acre) was sown on the *bájri* stubbles, with a heavy drill in October. The field was well ploughed for the *bájri* but was only harrowed (insufficiently) for the gram. 431 lbs. pulse per acre was estimated locally as an 8-anna outturn. Compared to the formulæ it represents a 15-anna crop. The táluka average is reported at 12 annas. With the by-products the acre yield is reported worth Rs. 11-9-0. The percentage incidence works out 14·46. This for a second crop is moderate.

Mr. V. B. Vádekar, District Deputy Collector,

Has again selected for experiment *jowári* with safflower subordinate to it. The same mixed crop has been tested for several years by this officer, and the report submitted this year repeats details reported in former years and with little or no change in the narrative.

The test (No. 65) is submitted as a special experiment, but I can only report it as an ordinary one, because the rule which exacts for special tests a minimum area of 5 per cent. of the holding has not been attended to. The test area (4 gunthas) was even less than that required by standing orders for an ordinary experiment. Two 2-guntha patches were selected, but the results from these could hardly accurately gauge those of the whole field (9 acres 39 gunthas). The field which has black soil bears an assessment of Re. 0-12-10 per acre. This year the field was ploughed once with a heavy plough drawn by 5 pairs of bullocks in January, and again similarly in April. The land is ploughed only once in three years. The benefit extends beyond one year and the cost which is heavy should be distributed accordingly in calculating cost of cultivation. On the field *bájri* is rotated irregularly with *jowári* and safflower. No manure was this year applied. The field was three times harrowed between June and September. The seed was drilled in September. The acre seed rate was 4 lbs. *jowári* and ½ lb. safflower. This is less than the formulæ and probably the information is erroneous. Six rows of *jowári* alternated with one of safflower. The proportionate area under each crop was, however, 12 to 1. The crop was bullock-hoed once. It was ripe on the 19th February. According to local opinion 197 lbs. *jowári* grain and 61 lbs. of safflower seed represent respectively 9 and 11-anna crops. The gross acre value of outturn is Rs. 11-10-6. The percentage incidence of assessment works out 6·87.

Mr. F. B. Young, Divisional Inspector, Land Records and Agriculture, C. D.,

Reports three experiments. All were carefully conducted and well reported. *Jowári* with safflower subordinate to it was first tested. The field (16 acres 14 gunthas) on which this crop grew, was mortgaged in 1874. The amount originally advanced on mortgage deed was Rs. 98 re-payable in three years and bearing interest at 2½ per cent. per mensem. The mortgagee through default in payment of principal and interest got possession of the field and has paid the assessment since 1878. If no interest at all had been paid by the original owner the initial debt would at compound interest have increased in four years to Rs. 280. That amount represents the cost of the field to the mortgagee, who now lets it on the following conditions, *viz.*, that he pays the assessment, that he gets ⅖ of the produce and allows the tenant ⅗ of the seed sown. Mr. Young's experiment shows that the gross value of acre produce this year amounts to Rs. 13-10-11, or for the field (allowing for *pot kharáb*) Rs. 212-1-2 :—

	Rs.	a.	p.	Rs.	a.	p.
Two-fifth of this being mortgagee's share, amounts to ...				84	13	3
Deduct assessment and Local Cess ...	7	7	0			
Deduct ⅖ seed approximate value, *viz.* ...	0	15	3			
				8	6	3
Net return this year to mortgagee for capital expenditure of Rs. 280.				76	7	0

The crop (Exp. No. 66) this year was considered an average one for the field and was also about average for the district. Half the field has fairly deep black soil, the other half has friable red-brown shallow *barad* soil. In selecting test areas due effect was given to unevenness of crop due to the inequality of soil referred to. The field grows *bájri* with subordinate pulses one year and *jowári* with safflower or wheat with linseed next. The seed-rate (5 lbs. *jowári* and 1 lb. safflower per acre) is the common rate in the district. The seed was drilled in September and the crop was ripe in the middle of February. The field is ploughed every second year and in other years it is only harrowed. This year it was harrowed with the heavy harrow three times, first in the hot weather and then during the rains. No manure is ever applied. The crop on the black soil portion was once hand-weeded, on the *barad* portion twice. The cultivation was good but the season unfavourable. The heavy rain of October damaged the safflower and did not benefit the *jowári*, but cloudy weather later is reported to have helped the cereal. The outturn (370 lbs. *jowári* grain and 18 lbs. of safflower seed) represents, according to local estimate, a 12-anna crop.

The returns from this officer's second test (No. 67) taken on deep black soil are good. Gram was the crop tested. It followed a rain crop of *bájri* which on account of the unfavourable kharif season was a partial failure. The tillage preparation for the *bájri* was more than ordinarily liberal. It is doubtful, however, whether as reported 40 loads of manure per acre were applied for the *bájri* crop. The field is in part classed as dry-crop and in part as garden land. The latter is irrigated by channel water conveyed from a dam built across a stream. The supply usually lasts till February. This year it was available to end of March. The area actually sown with gram and irrigated was $2\frac{1}{2}$ acres, whilst only 1 acre 33 gunthas is classed as *bágáyat*. Inclusive of water-rate (apportioned over the area actually irrigated) the assessment is Rs. 3-11-2 per acre.

Before drilling the gram ($55\frac{3}{5}$ lbs. per acre) in November, the field was worked with a four-coulter drill, the iron shod coulters of which loosened and grubbed out the *bájri* stubble. An ordinary harrow used afterwards smoothed the surface. The seed was then drilled with a four-coulter drill. The crop was watered every fortnight up to the end of January. It ripened in the middle of February and produced 782 lbs. pulse and 450 lbs. by-product. This outturn, the experimenter is inclined to think, represents a 14 or 15-anna crop, but the local estimate was only 12 annas. The percentage incidence of assessment (18·49) is rather high, but it only applies to the second crop. Moreover, at date of experiment, gram was selling cheaply ($40\frac{1}{2}$ lbs. per rupee). The average rate for the whole year was about 29 lbs. per rupee.

Safflower, subordinate to wheat, gave, in Mr. Young's third test (No. 68) a full average outturn. The field was half harvested before the test areas were selected. The experimenter judged of the evenness of the crop by the stubble. This would prove a formidable task for an expert farmer. The field forms part of a large holding (196 acres) cultivated, with the exception of two garden numbers, by the registered occupant. The fields which are leased are let on the following conditions. Owner pays $\frac{1}{4}$ assessment and finds $\frac{1}{4}$ seed; also $\frac{1}{4}$ price of *mots* and ropes and provides thorns for fencing. The tenant gives him $\frac{1}{4}$ gross produce. The season was exceptionally favourable for late sown safflower and also for any wheat which escaped rust attack. The field, assessed at Re. 1-10-1 per acre, has deep moisture holding soil and the heavy late rains contributed to the field sufficient moisture to properly mature both crops. No manure was applied and none has been given for the last six years. It was not ploughed this year, but was harrowed once before the rains and three times between June and October. The soil was once stirred with the *moghad* which is a two-coultered seed drill with seed bowl and seed tubes removed. The action of this implement if weighted with a stone is to deeply stir the soil by means of the two iron shod tines or coulters. The seed (40 lbs. wheat and $\frac{2}{3}$ lb. safflower per acre) was drilled in October. The crop was ripe early in March and yielded 620 lbs. of wheat grain and 169 lbs. of safflower seed. This outturn is considered a 16-anna one. It is noted by the experimenter that some soft white rather swollen grains (called *pote*) were observable in the wheat sample. These

are soft starchy grains, and they differ in consistence from the seed sown (the variety was *pivla*) because the season was more than usually wet and cloudy. Wheat was worth 24 lbs. and safflower 30½ lbs. per rupee.

Poona.

The programme laid down for the Assistants in this district was fully worked out. Mr. Mollison, Superintendent of Farms, made three experiments in garden crops at Khed.

Mr. C. P. B. Wiltshire, Assistant Collector,

Tested wheat, onions and potatoes. The two latter are important cold weather crops of the Khed and Junnar circles of the Poona District. The experiments were carefully conducted but the reports are sketchy.

The first test (No. 69) was taken on dry-crop wheat grown on black soil assessed at Re. 1-1-6 per acre. The field grew three successive wheat crops during the last three years. This shows no appreciation of the value of rotation, and as no manure was applied this year and the cultivation was otherwise indifferent, it is surprising that the yield was as good as it was. 361 lbs. grain and 865 lbs. straw and chaff represent according to local opinion a 20-anna crop. The estimate is based on the capabilities of the field as indicated by the best previous crop in comparison with the one tested, but under more liberal management the field is capable of giving much better results. The seed was drilled in October, 48 lbs. per acre was the seed rate. The crop was ripe on the 24th February; meantime no rain fell but cloudy weather and dew at night during 15 days immediately before harvest induced rust. If the rust had appeared earlier the grain as well as the straw would have been damaged. The effect of rust, when it appears a month before harvest, is to shrivel the grain. The plumpness of the grain was not much affected. The sample sent to my office had a bushel weight of 61 lbs.

Mr. Wiltshire made an experiment (No. 70) on onions at Chákan where high market garden cultivation is common. The crop was grown on black brown soil classed as garden land and assessed at Rs. 2-6-8 per acre. This land grows usually two crops every year. The crops grown during the last three years were:—

1890-91 ...	1 Bájri. 2 Gram.	1891-92 ...	Bájri.	1892-93 ...	1 Bájri. 2 Onions.

The seed as usual was first sown on a seed-bed in August and the seedlings were transplanted in September. The proportionate area of seed-bed to acre of transplantation works out 1⅞ guntha. The seed was sown in the seed-bed at the rate of 9½ measure sers per acre of transplantation. The formulæ seed rate (3 lbs. per acre) is undoubtedly wrong. The quantity ordinarily required is about 15 lbs. Twelve loads of cowdung manure were applied as a top-dressing to 22 gunthas after transplantation. The reason why it was not applied before was probably that there was not sufficient time between the harvesting of the rain crop (*bájri*) and the transplantation of the onion seedlings. No account is given of the tillage operations. The crop was irrigated from a well but the extent of irrigation is not stated. The bulbs were ripe in the middle of March and were then dug. After removing green tops they weighed 15,580 lbs. (almost 7 tons) per acre. This according to local estimate is a 16-anna outturn. The green tops taken from ripe bulbs have no economic value. The bulbs were weighed as they were dug; consequently a considerable loss of weight due to dryage must have resulted before they were sold. Onions cannot be stored in bulk until they are sun-dried sufficiently long to make the outside membraneous covering crisp. The gross value of outturn amounts to Rs. 72-2-1. This is a poor return from an expensively cultivated garden crop and is partly accounted for by the suspiciously low market rate at which the bulbs were valued, *viz.*, 216 lbs. per rupee. The results of this test compare unfavourably with those of two experiments made in the same táluka in 1889-90. These experiments gave respectively nearly 12 and nearly 13 tons bulbs per acre and at the time onions were worth 124 lbs. per rupee.

Mr. Wiltshire's potato experiment (No. 71) was made on mixed black land which, inclusive of a right to channel water, is assessed at Rs. 8-9-10 per acre. The potatoes followed a rain crop of *bájri*, the crops grown in 1890 and 1891 being respectively sugarcane and chillies. The rotation indicates that the land is in high manurial condition, yet it is reported that 39 cart-loads of cowdung and sheep manure was applied per acre for the potatoes. The potatoes were planted in December. This is later than usual. They ripened in the middle of March. The irrigation water was sufficient. The per acre yield of tubers weighed 9,213 lbs. No mention is made of the prevalence of disease, but the produce is valued at only 128 lbs. per rupee and must either have been badly diseased or undervalued. In Poona at date of experiment the most inferior indigenous potatoes were worth 60 to 70 lbs. per rupee. The cost of transport does not account for the difference. I think the gross outturn is much undervalued at Rs. 71-15-7 per acre. That amount would not meet cost of cultivation.

Mr. H. W. J. Bagnell, Assistant Collector,

Reports two groundnut tests. The first crop experimented upon occupied the low-lying portion of a large number, the soil of which is better than the main portion of the field. The assessment exigible from the field (Re. 0-6-5 per acre) does not therefore fairly represent the value of the land experimented upon. Groundnut is taken every alternate year and is rotated in turn either with *jowári* or *bájri*. The cultivation of groundnut is usually an indication of the cultivator being well-to-do, but neither of Mr. Bagnell's tests indicate that the cultivators are in easy circumstances; on the contrary the cultivation was in each case by no means liberal, and the results are consequently poor. The first field tested (No. 72) has light friable soil. No manure was applied but the groundnut may have been benefited by the wash from the higher lying portion of the field.

The field was only once ploughed before being formed into beds for irrigation. The seed was drilled in June, first lengthwise and then across the field. This secured even distribution. The acre rate (28 sers) should have been stated in pounds. The cultivation is described as poor. The flood-water of heavy rains in October damaged the crop to some extent; otherwise the season was favourable. The field was watered five times from the Nira Canal at a cost of Rs. 4 per acre.

The crop was ripe in the middle of February and yielded 1,283 lbs. nuts in shell and 1,193 lbs. of haulm per acre. The latter is recognised as a valuable fodder and is much undervalued at 10 annas per acre. I think the anna estimate of the crop is far too high.

This officer's second test (No. 73) was taken on land assessed at Re. 0-15-3 per acre. The area experimented upon is rented by a tenant from the registered owner. The tenant pays for a portion of the whole number Rs. 15, but the area so rented is not stated. This according to standing orders should have been done. The field has light soil liable to crack and to dry quickly. Except that this crop was irrigated oftener (7 times) and that the seed rate (20 sers per acre) was less than that reported in the previous test, other conditions of cultivation were for both crops similar. The outturn in the second test is somewhat better than that of the first; 1,537 lbs. of nuts in shell and 3,198 lbs. of haulm per acre is perhaps correctly estimated at 14 annas, although I should be inclined to think 10 to 12 annas nearer the mark. Also the by-product is again much undervalued at Re. 1-6-6 per acre.

All the figures given by this experimenter were calculated on the basis of 42 tolas per pound and they had therefore to be corrected throughout in both the tests. Moreover, the weights of local sers noted by the experimenter, and as found in this office, show considerable difference :—

	Weight found in Office.	Weight noted by Experimenter.
	Tolas.	Tolas.
First test (No. 72)	35½	32⅝
Second test (No. 73)	34⅜	39⅔

Mr. C. N. Seddon, Assistant Collector,

Sends in a report on a *jowári* experiment. There is a considerable difference between the weight of sample ser as found in my office and as reported by the experimenter. This throws doubt on the accuracy of the outturn figures. If the exact amount of grain measured by a ser measure was sent to my office then the acre averages should be less than those reported by 13·3 per cent. The experimenter explains that when the grain was measured it was not quite dry, but this only partially accounts for the difference. In other respects the test was carefully made and fully reported.

The field experimented upon (No. 74) was part of a large number (16 acres 28 gunthas) which the experimenter says is *bágáyat* land. The assessment (revision survey) is 13 annas per acre. The rate indicates that only a small portion is *bágáyat*. There is a good old well in the centre of the holding. This year on account of copious late rains only one watering was given to the *jowári* crop. It occupied slightly less than an acre. The soil is of the first order and grows *jowári* and wheat in alternate years with no fallow. Five loads of town sweepings (nightsoil and household refuse), sold by Indápur Municipality at 2 annas per cart-load, were applied to the area under *jowári*. This manure was applied after deep ploughing in the hot weather. When the land dried sufficiently after the first break of the monsoon the seed was drilled. The seed rate reported (40 lbs. per acre) is high, but where fodder and grain are alike valuable, the seed rate is invariably high. The crop is said to have been damaged by too much rain, but the outturn figures do not indicate anything of the sort. The crop was watched but small birds did damage. The seed is reported to have been sown at the end of June or beginning of July. I think this statement is not correct as the crop did not ripen until the end of January. It was carefully hand-weeded twice. The outturn, 1,143 lbs. grain and 8,755 lbs. *kadbi* and chaff, is estimated as a 13-anna outturn. The registered owner is not the occupier. The latter finds everything and pays his rent in kind. One-third of the produce is given as rent to the owner who pays the Government assessment. I consider the fodder undervalued by the experimenter, but if we take the reported figures (which as already explained possibly should be reduced by 13·3 per cent) then the gross value of produce amounts per acre to Rs. 38-3-10.

Mr. J. W. Mollison, Superintendent of Farms,

Submits three tests on garden crops at Khed.

His first test (No. 75) is on irrigated wheat, *kálikusal*, on medium black soil. The field grows *bájri* with a second crop of wheat or gram in alternate years with groundnut, which alone is manured. The season was favourable for rabi crops in general, and the crop under test fairly represented the average of the locality. As elsewhere, it was damaged to a slight extent by rust owing to cloudy weather.

In preparing the field for wheat the *bájri* stubble was twice broken with a heavy four-coulter drill which was weighted so that the tines penetrated to a considerable depth. The soil was further stirred by the harrow, *vakhar*, drawn by two bullocks. The seed was then drilled with the *pábhar*, first lengthwise and then across the field. This secured even distribution. A harrow followed and covered the seed. The crop was twice hand-weeded and copiously watered once at the beginning and again at the end of December. Late rains were unusually favourable and further watering was not required. Mr. Mollison watched the harvesting of the crop on the whole field and found that five women in three days reaped 3½ acres and that two men following them bound the sheaves and carried them to the threshing floor in the same time. Four bullocks driven by one man trampled out the grain from the four-guntha plot in about three hours and two men winnowed it in about an hour.

The next two tests were taken on potatoes at Khed where high class garden cultivation is practised on an extensive scale. Mr. Mollison observes that the character of the soil in most fields suits irrigation admirably. Subsoil water can be found at a depth of 20 to 30 feet, and many wells have been built since

the completion of the revision survey. The extension of garden crops has created a great demand for manures, and in spite of caste prejudice poudrette is now used very freely. Every householder in the Khed village conserves the household waste in a pit near the house or in the compound. Non-cultivators sell to cultivators and a householder makes Rs. 20 or more per annum.

The experiments were made with two objects in view: 1st, to determine approximately the average outturn of potatoes in the very centre of its cultivation, and secondly to compare the outturn values per acre with cost of cultivation and thus gauge the actual profits.

The first crop selected (Exp. No. 76) followed a rain crop of *bájri* on blackish loamy soil which grew the same crops continuously for the last three years. Mr. Mollison gives a full account of the mode of cultivation.

> "The method of cultivation practised at Khed is almost identical in all fields. When potatoes follow *bájri* (which is the usual practice) the field is cleared of the rain crop as early in October as possible, and the stubble at once deeply ploughed. Manure may either be applied before or after the first ploughing. It is carried to the field in large carts drawn by four bullocks. The capacity of these carts varies from 40 to 45 cubic feet; 10 to 13 cart-loads per acre of manure is an ordinary application. This is equivalent to 15 to 19 tons per acre. The manure when spread is ploughed in. The best cultivators plough three times before planting and harrow once or twice. The soil should be made friable to a depth of six inches and be quite smooth. When in this condition the sets are planted. Cut sets are used. Medium-sized potatoes are cut into four pieces, small potatoes into two. The sets are planted in a furrow made by an ordinary plough, and the soil moved in making the next furrow covers them. The sets are about 7 inches apart in the rows and the rows are 9 inches distant from each other. A hand hoe with a wooden head-piece is used to smooth the surface and draw up sufficient soil to form a small divisional ridge between beds. Each bed is about 3 feet wide and contains 4 rows of potatoes. The beds are of varying length, depending upon the levelness or otherwise of the field. Usually the beds are of the same width or length as the field. The irrigation water is admitted to each bed in turn and flows slowly from its higher to its lower end. The field is irrigated as soon as the sets are planted and thereafter every eight or ten days until the crop approaches maturity. Three weeks before ripening water is withheld. This admits of the soil drying sufficiently to allow the use of the plough in harvesting the crop. A good Kunbi is exceedingly expert in guiding his plough along each row of potatoes. Women following after collect the tubers thus exposed. One ploughing is not sufficient. Usually a second cross ploughing and a third diagonally of the field are required before all the potatoes are collected. The field is left in the best possible condition for the next crop. When the rains came in the following June, *bájri* is at once drilled; consequently the kharif crop is grown at a trifling cost, and this advantage should be credited to the preceding crop of potatoes.
>
> "Potatoes are usually planted late in October or early in November and mature in three and a half months. Meantime they are usually hand-weeded twice."

The crop produced per acre 8,490 lbs. tubers, which like all indigenous potatoes were small in size and poor in quality. They moreover showed signs of ring disease. As it is well known that potatoes tainted with disease will not keep any time in bulk, the markets become over-stocked with such produce at harvest time and the prices obtained are very low. If, on the other hand, the tubers are sound, they can be stored and sold at nearly double the prices a few months later. The actual profits per acre, therefore, depend upon the soundness of the crop and the means of the cultivator, *i.e.*, whether he can afford to store his crop until such time as market rates get high.

The following table summarises the approximate charges for the various tillage operations performed. The experimenter observes that labour is scarce in the district at all seasons, and although the labour employed was mostly home

labour, it may fairly be charged for at the following rates: a man 3¾, a woman 2, and a pair of bullocks 8 annas per day:—

Operation (area 1 acre 5 gunthas).	Amount. Rs.	a.	p.
First ploughing; 1 man, 4 bullocks, 2 days	2	7	6
16 cart-loads of manure at Rs. 3 per load	48	0	0
Carting manure; 4 bullocks, 1 man, 2½ days	3	1	4
Spreading manure; 4 women, one day	0	8	0
Second ploughing; 1 man, 2-bullock plough, 2 days	1	7	6
Clod crushing and levelling; 3 men, 1 day	0	11	3
Planting potatoes; 3 days, 1 man, 2-bullock plough, 1 man making beds, 1 man cutting sets, 4 women planting	5	1	9
4½ *pallas* seed at Rs. 10 per *palla* (280 lbs.)	45	0	0
Hand-weeding after third watering; 6 women, 1 day	0	12	0
Ten waterings; 2 men, 2 môts, 4 bullocks took 1½ day each time ...	22	3	9
Harvesting; 1 man with 2-bullock plough, 5 women gathering, 1 man carrying to heap and sorting lift 1½ acre per day	7	2	9
Total (for the whole area) ...	136	7	10
Per acre ...	121	5	2
Value of produce per acre	151	9	10
Cost of cultivation per acre	121	5	2
Profit per acre	30	4	8

The second crop of potatoes tested (No. 77) followed in the same year a rain crop of potatoes. This practice, which is a sure way of establishing the ring disease already so rife, is to be deprecated. Part of the field tested was planted with seed obtained from the kharif crop raised in the same field and produced a diseased crop; the remainder with seed obtained from an outlying village and gave apparently healthy produce. The experimenter selected his test area from both in a way to give a fair average for the whole field. Both the kharif and rabi crops were liberally manured and the outturn was above the average. The cultivator intended to keep the whole produce of the bought seed for future planting and for sale as seed, while that from home-grown seed had to be disposed of at once.

The harvesting operations of the kharif crop had prepared the soil in a most thorough manner. The cost of cultivation, therefore, was considerably less in this case than that noted for the first test. The value of outturn based upon the low rates prevailing at the time of experiment comes to Rs. 201 and the experimenter thinks the profit per acre would exceed one hundred rupees.

Shola'pur.

From this district were received three reports by Mr. Brown and two by Mr. Heblikar. The latter did not conduct a third test in *bájri*. That crop was damaged by excessive late rain and a suitable crop for experiment could not be easily found.

Mr. R. C. Brown, Assistant Collector,

Submits three tests. The reports are not very full. There is in each experiment a considerable difference between the weight of measured samples as found in my office and as recorded by the experimenter. In one test the weight of sample ser is less than that reported. The difference may be accounted for by dryage. In the other two experiments the differences are inexplicable unless due to inaccuracy. Wheat, *kardai* and linseed were subordinate to *jowári* in the first crop tested (No. 78). The wheat and linseed were treated as non-existent, not because there were no plants growing, but because only two sers of linseed and three of wheat were used mixed with 36 sers of *jowári* and 6 sers of safflower. Considering the relative sizes of the seeds wheat and linseed ought to have been as much in evidence as the safflower. Probably they were not, as the season being wet was unsuitable for linseed. The field is poor and is assessed at 12 annas per acre. It had lain fallow for four years on account of the owner's inability to cultivate it. The crop estimated at 16 annas gave an outturn worth

per acre Rs. 11-4-2. The cultivation is described as good. No manure was applied.

Khapli wheat (Exp. No. 79) on better land gave a fair return. The field is close to the village, gets its sullage and needs no other manure and appears to be capable of growing double crops every year. Maize followed by wheat has been taken in each of the last three years. The wheat was drilled in October-November. The seed rate is put at 102 lbs. per acre. The crop was irrigated 8 times from a well at intervals of 12 to 14 days. It was ripe on the 24th of February and yielded 1,600 lbs. of clean grain worth Rs. 52-3-6 and straw is perhaps undervalued at Rs. 1-11-2 per acre. This represents an 18-anna outturn though estimated at 20 annas by the experimenter.

The third field (Exp. No. 80) bears an assessment of Re. 0-12-9 per acre. Three distinct varieties of soil occur in the field. Safflower alone or mixed *jowári* and safflower are usually taken. A mixed crop was this year grown. The seed was drilled in September-October in the proportion of 1 ser safflower to 2½ sers *jowári*, and the crop was ripe early in March. As in the first test the outturn of safflower is given in sers and that of *jowári* in pounds and it is impossible to know the exact equivalent in pounds of each. The seed rate per acre was 4⅔ lbs. *jowári* and ½ ser safflower. The outturn per acre was 430 lbs. of *jowâri* and 12½ sers of safflower.

All three experiments show a very moderate percentage incidence of assessment.

Mr. B. R. Heblikar, District Deputy Collector,

Reports two tests, the first on rabi *jowári* and the second on *jod* or *khapli* wheat. The first (No. 81) gives rather poor results, for which the season is chiefly responsible. The soil of the field is black. It is assessed at Re. 1-1-11 per acre. Gram is grown alternately with *jowári*. This year the field was lightly manured with cowdung (2 loads per acre). The cultivation is reported to have been good, and had not heavy rains late in the season damaged the crop the outturn would have been more satisfactory. The seed (6 lbs. per acre) was drilled in September, and the crop was harvested early in March. 276 lbs. of grain and 833 lbs. of straw represent, according to local estimate, a 10-anna outturn. The whole produce from the test areas was placed in charge of the Bhág Kárkun, and was not weighed or measured until the experimenter returned to the village, two months after date of experiment. The same course was adopted in this officer's second test. In each case the test areas were large, being respectively 1 acre and 16 gunthas. By keeping the produce so long, the owners of the fields must have been put to inconvenience, if not loss, and a practice which cannot fail to make crop tests unpopular should be strongly deprecated. It is quite possible that during two months' storage a portion of the grain might have been eaten by rats or otherwise lost.

This officer's wheat test (No. 82) shows much better results. The field which has white soil (*pándhari*) is favourably situated in respect of the village. The occupant has thus facilities for getting manure of which he takes advantage. The field bears an assessment of Re. 1-4-7 per acre and is twice cropped every year. The sequence of crops during the last three years was as follows:—

1890-91 ... { Maize. Wheat. } 1891-92 ... { Rála. Wheat. } 1892-93 ... { Maize. Wheat. }

The cropping indicates that the occupant has no proper appreciation of good rotation. Thirteen cart-loads per acre of ordinary manure was applied as a top-dressing to the wheat. The crop was irrigated from a well but the extent of irrigation is not reported. The field had to be re-sown, because heavy rain fell after the first seeding and destroyed the seedlings. The seed was sown a second time in December rather unseasonably. All other conditions were favourable. 76 lbs. grain in husk per acre is the reported seed rate. The crop was harvested in March and produced 1,567 lbs. grain in husk and 2,297 lbs. of straw per acre. The gross value of outturn amounts to Rs. 43-4-6 per acre. The burden of assessment is very light. The incidence works out 2·97 per cent. I think, however, the crop was above average for the village.

Satara.

Messrs. Fry and Kelkar forward three ordinary experiments each from this district. Mr. Fawcett failed to conduct any owing partly to his absence for a

month in Thána where he was attached to a survey party, and could not find a suitable crop during his stay there, and partly to his detention at head-quarters on other duty.

Mr. T. D. Fry, Assistant Collector,

Reports three crop tests. The first (No. 83) is on rabi *jowári* (*shálu*) with subordinate rows of *kardai* (safflower). The oil-seed occupied every eighth row. The outturn from the field was poor; that of safflower was proportionately better than that of *jowári*. The field carried a crop which in the opinion of the experimenter was not inferior to the large majority of the crops he saw in the neighbourhood. The shade of large trees damaged the borders of the field; the season was unfavourable and slight loss was caused by disease which the cultivators called *chikta*, and which was attributed to excessive rain. A characteristic of the disease is the appearance of gummy matter on the plants. This was probably a viscid exudation, which is often observed associated with insect attack. The field, which was very lightly manured, has poor black soil mixed with lime nodules and is assessed at Re. 1-2-5 per acre. The seed was drilled at the end of September, and the crop was ripe in February. The experimenter says a five-coulter drill was used; probably the implement had four coulters, otherwise safflower could hardly have occupied every eighth row.

The seed rate of *jowári* is stated at about 9 lbs. per acre; that of safflower is not reported, because the cultivator's statement could not be accepted as accurate. 196 lbs. of *jowári* and 29 lbs. of oil-seed per acre are respectively estimated locally at 5 and 8 annas. Under the circumstances the burden of assessment is by no means heavy. The percentage of incidence works out 12·10.

Gram was the subject of this officer's second test (No. 84). This pulse is ordinarily taken on the field tested every second year as a second crop after *bájri*. The usual rotation being *jowári* one year, *bájri* followed by gram next. This year *bájri* failed completely, and the only return was got from the second crop. If we bear this fact in mind, and also note that sowing was late on account of excessive rain in November, we must consider the incidence of assessment fair for a 12-anna outturn, although it works out 18·94 per cent. In anticipation of growing a rain crop (*bájri*) the field was rather liberally manured by application of 3½ loads ordinary manure per acre, and by folding 250 sheep per acre for four nights. *Bájri*, if it had not failed, would have benefited more from the manure than the pulse did. The gram did not ripen until March. 468 lbs. of pulse and 439 lbs. of by-product is by no means a bad outturn even for a land assessed as this field is at Rs. 2-6-3 per acre.

Mr. Fry's third test (No. 85) on irrigated *khapli* wheat furnishes some useful information. The crop was a second crop after *bájri*, which was said to have been a fair crop. The field was manured for *bájri*, but not for the crop tested. Inclusive of water rate the soil is assessed at Rs. 4-3-4 per acre. The crop was watered from a one-*môt* well but how often is not shown. 68 lbs. per acre of grain in husk was sown. This for an irrigated crop is a low seed-rate. Drilled early in November, the crop ripened early in March. It appears to have run somewhat to straw. It produced 1,337 lbs. of grain in husk (equal to 978 lbs. clean grain) and 2,561 lbs. straw per acre. Over a ton of straw per acre is perhaps underestimated at Rs. 2-8-0. The gross outturn was worth Rs. 46-4-0 per acre. This according to local opinion represents an average return from the field.

Mr. V. R. Kelkar, District Deputy Collector,

Sends three careful tests. The first is on groundnut, the second on gram, and the third on irrigated spelt wheat. The field growing groundnut (Exp. No. 86) is watered from a *pát* fed from the river Mán and constructed by private enterprize. The cultivator's share of the water is three hours each fortnight. The assessment (soil and water combined) is Rs. 5 per acre. The land is usually twice cropped except in the years when *bhuimug* is grown. During the last three years the following crops were grown:—

1889-90	... Groundnut.
1890-91	... Hot weather jowári. Barley.
1891-92	... Italian millet. Wheat.

To the field tested ordinary manure (25 loads per acre) was applied. The field was then ploughed and worked well to prepare it for sowing. The four-coulter drill was used early in June to form furrows into which the seed (44 lbs. per acre husked nuts) was dropped by hand. Ten women were occupied in sowing, but they must have sown more than 16 gunthas (the area of the field) in one day. The plants grew 5 to 6 inches apart in the rows, and the rows were about a foot distant from each other. After sowing the seed was covered, and the surface smoothed with the harrow. What the subsequent cultivation was is not shown, but as it is described as good, presumably the crop was hand-weeded. The crop was slightly damaged by excessive late rain in October. It was ripe in February. Probably it was irrigated once a fortnight after the rain ceased. But this is not clear. The outturn which amounts to 1,877 lbs. unhusked nuts (*shenga*) and 4,082 lbs. of haulm (*vel*) classes the crop as an average one according to local opinion. But land assessed at the rate noted should be capable of giving much better results under favourable conditions. I think the *vel*, which is a valuable fodder, is undervalued at Rs. 5-9-10 for 4,082 lbs. The ratio of unhusked nuts (*Shenga*) to husked nuts (*Dáne*) is, 80 to 61. The percentage incidence of assessment works out 7·04. This must be considered high if we bear in mind the expensive operations which the cultivation of groundnut entails.

The gram (Exp. No. 87) grew on a field which carries *Shálu jowári* every second year, and grows in intermediate years either wheat having subordinate rows of safflower or gram alone. The field bears an assessment of Rs. 2-10-8 per acre, and the test indicates that the burden of assessment is rather heavy in that the field, for reasons which are not clear, never grows kharif crops. About a bushel of seed (65 lbs.) was drilled in November with a heavy drill. This was the second sowing; the first failed through heavy rain immediately after sowing in October. The seed-rate is high compared with the formulæ. The formulæ are probably wrong. It is important that the seed should be deposited deeply, so that moisture sufficient for germination is reached. For this purpose the drill was loaded, so that eight bullocks were required to draw it. A heavy harrow following the drill covered the seed. Although sown late, the season was not unfavourable. The cultivation is described as good. This ought to mean that the field had been well ploughed for the crop. The double working due to twice sowing should have been advantageous. The crop was ripe at the end of February, and produced 469 lbs. pulse and 495 lbs. of useful by-product. The grain was not dear at 33½ lbs. per rupee, and the fodder, which is considered good when mixed with cereal fodder, ought to have been worth more than 5 annas per acre. The gross outturn was worth Rs. 14-4-6 per acre, and this was held to represent a 14-anna outturn. The ameliorating effect of a crop of gram on the soil, and the manurial residue which it leaves there are beneficial to a cereal crop taken the year after. All cultivators fully appreciate this benefit. The percentage incidence of assessment is decidedly high. The remarks made above indicate why it is so.

On land which was slightly salt before it was improved by drainage, &c., *khapli* wheat (Exp. No. 88) yielded fairly well. The crop estimated at 13 annas produced 933 lbs. of clean grain and 1,968 lbs. straw per acre. The crop was uneven through damage done by rats (which have been destructive in many districts this year), but due allowance was made for the inequality in selecting test areas. The outturn from the test area where damage was least was one-fourth more than that where the damage was most. The wheat was a second crop after *mhási* rice. On the part of the field tested, the following was the sequence of crops during the last four years—first *varádi*, second *rála*, third *varádi*, fourth rice or wheat. The field is a large field of 7 acres 12 gunthas, of which only 39 gunthas are classed as *bágáyat*, whereas about 2½ acres are under irrigation and garden crops such as onions, chillies, groundnut, sugarcane, &c., are largely grown. The wheat was drilled with a heavy drill in November, and the crop ripened late in March. The seed-rate (139 lbs. grain in husk) is high. The ratio of grain in husk to clean grain was found to be as 205 : 100 by measure, and as 129 : 100 by weight. The field was well manured by folding with sheep about a week before the seed was sown. The soil was moist from heavy late rain when the seedlings were young, but the crop mainly depended upon irrigation; five waterings were given and were sufficient. The grain was worth 23¾ lbs. per rupee, and the straw (valued at rather a high rate) was estimated to be worth Rs. 6-4-0 per acre. The gross outturn was worth Rs. 45-13-0. The incidence of assessment (10·07 per cent.) is by no means high for a second crop.

SOUTHERN DIVISION.

Belgaum.

Only five reports were received from this district :—

Mr. R. E. Enthoven	...	3 ordinary.
Mr. C. C. Boyd	...	1 do.
Mr. N. G. Deshpánde	...	1 do.

The Collector explains that both Messrs. Boyd and Deshpánde could not conduct more than one test each, as the former was away on survey duty and the latter joined the district only in January.

Mr. R. E. Enthoven, Assistant Collector,

Sends three crop tests, one on rice, and two on Italian millet. The rice (Exp. No. 89) was a drilled crop, grown on dark red *masâri* soil assessed at Rs. 4-12-11 per acre and irrigable from the village tank. 58½ lbs. seed drilled with a six-coulter drill in May produced a ripe crop in November. The outturn, 2,166 lbs. grain, (the by-product was not weighed) classes the crop according to local estimate as an average one. I agree with the experimenter in considering the anna estimate too low. The field was fairly manured, the cultivation is described as good, and the season favourable.

This officer's *navani* tests are of value in showing what the burden of assessment is in an unfavourable year. The rain was too much for the Italian millet as also for the subordinate row crops in each of the fields tested. *Navani* is a valuable millet for cultivation in India because in seasons of drought it speedily provides a fair outturn of grain and good fodder. Excessive late rain damaged each of the crops tested. The cultivation in one case described as indifferent and in the other as bad is partially accountable for the poor returns.

In the first test (No. 90) *jowári* was subordinate to *navani*; ¼ ser of the former and 3 lbs. of the latter being sown per acre. Drilled in August, the crops ripened at the end of November. The *jowári* produced no grain and *kadbi* was valued at Re. 0-2-6 only per acre. The *navani* yielded 263 lbs. of grain per acre and its fodder was not weighed, but is valued at 10 annas per acre. The gross outturn from land assessed at Re. 0-14-5 amounts to Rs. 4-4-6. The crop is overestimated at 16 annas.

This officer's second *navani* test (No. 91) gave equally poor results. The field experimented upon has poor stony land assessed at Re. 0-6-10 per acre. *Kulthi* and *jowári* were subordinate to the principal crop, but they yielded no grain and the combined value of their fodder amounts only to Re. 0-7-6. The field was liberally manured with ordinary manure directly applied and by folding sheep in June. The seed (3½ lbs. Italian millet, 1½ sers *kulthi* and ⅛ ser *jowári*) was drilled seasonably in July. The crop was reaped early in December. In this test 252 lbs. grain and 500 lbs. of *navani* fodder (practically the only produce from the field) was locally held to be an 11-anna crop. In the first test the incidence of assessment is 21·10, in the second 8·7 per cent.

Mr. C. C. Boyd, Assistant Collector.

This officer's wheat test goes to show how disastrous rust may prove in a season favourable for rust. The red disease (*kunkum rog*), which was particularly prevalent in 1892-93, is attributed by cultivators to dry south-winds, blowing a month or so before the wheat crops are ripe. The real cause of the disease is obscure. Thorough recent investigation in other countries has proved that some varieties are more susceptible than others (spelt wheat is exempt) and climatic conditions (especially cloudy close weather) exercise a certain influence in favouring the progress of the disease.

The field tested (No. 92) has mixed black soil assessed at Re. 1-5-3 per acre. It was well cultivated and fairly manured. 51¼ lbs. of seed drilled late in

October produced a crop which ripened early in February and yielded 329 lbs. grain and 406 lbs. straw. The bushel weight of the grain (61 lbs.) was high, considering that one of the serious effects of rust is to shrivel the grain and make it light. The outturn was estimated by the owner at half the usual average of the field; and the experimenter remarks that the crop tested was a little better than the average of the district this season.

Mr. N. G. Deshpánde, District Deputy Collector,

Sends a safflower test. It is unusual to find safflower as a sole crop anywhere in the Presidency except in Gujarát, where it is grown for its dye as well as its seed. The unusual character of the season of 1892-93, particularly in respect of heavy September-October rains, was probably the reason which induced cultivators in the Belgaum district to sow large areas with safflower as a sole crop.

The field tested (No. 93) has black land assessed at Re. 0-15-0 per acre growing according to the character of season kharif or rabi *jowári*, cotton, *bájri* and gram and occasionally *rála*, safflower, *kulthi* and *tur*. The cultivator who occupies 21 acres 6 gunthas fully appreciates the value of rotation. He had this year 8 acres 14 gunthas of his holding under safflower *(kusubi)*. A fair average of the field was got from five test areas, which in the aggregate measured 40 gunthas or 1 acre.

The seed was drilled with a four-coulter drill, about the middle of October. The seed rate is, I think, considerably understated at $4\frac{1}{4}$ lbs. per acre. The crop was ripe early in February, and gave an outturn of 794 lbs. per acre of oil-seed which for unmanured land must be considered satisfactory. The stalks and other by-product have no commercial value except as fuel. The gross acre value of the crop amounts to Rs. 14-9-6. The incidence of assessment works out 6·53 per cent. The experimenter remarks that the field was no better than others in the district where all the crops were estimated at 20 annas.

Bija'pur.

Mr. Hervey tried an experiment on wheat, but finding the area below the prescribed minimum left it unfinished. No further attempt was made by him and no explanation has been received. Mr. Artal submitted three tests on wheat which would have been more valuable had the experimenter selected test holdings in different parts of his charge. Mr. Cursetji sends one ordinary test on wheat.

Mr. J. M. Cursetji, District Deputy Collector,

Submits one ordinary experiment. The crop tested (No. 94) was red dry-crop wheat. The variety is locally known as *khair godhi*. The experimenter estimates the cost of cultivation, but the figures are obviously inaccurate, and I do not report them. Ploughing is charged for on the assumption that one plough turned over an acre in three hours. The information which can be gleaned from the test is not of much value. The experimenter says there is no rotation and yet the explanatory notes show that a large variety of crops are grown every year on the holding. The wheat is never manured and it is not credible that it occupies the same plot every year. Safflower was subordinate to the wheat. The test area was 10 gunthas and 9 annas, of which $6\frac{1}{2}$ annas were under safflower, but how this calculation was arrived at is not clear. On land assessed at Re. 0-10-2 the outturn (262 lbs. of grain) is held to represent a 10-anna crop. The by-product, 442 lbs. straw, is stated to have no value and the safflower was not tested.

Mr. R. C. Artal, District Deputy Collector,

Sends three ordinary tests. Dry-crop wheat was in each case experimented upon and safflower sown mixed with the wheat in every eighth row was subordinate to each of the principal crops.

The first field tested (No. 95) grows rabi crops of late *jowári*, gram, wheat and safflower. A rain crop of cotton is occasionally taken. The soil is black

and is assessed at Re. 0-13-11 per acre. No manure has been applied for 7 or 8 years. The field was not ploughed. The heavy harrow only was used to prepare the field for sowing; 29⅔ lbs. seed per acre was drilled in November. Heavy rain delayed sowing, and the crop suffered accordingly. The seed rate is less than that of the formulæ, and the figure is probably erroneous. The crop was ripe in the middle of February just three months after sowing. It was selected as an average crop of the district this year, and was locally estimated at 10 annas. The outturn of safflower is an unknown quantity, but the wheat yielded 379 lbs. grain and 547 lbs. straw, worth together Rs. 13-3-8. The incidence works out 6·57 per cent.

On heavier black land bearing nearly the same assessment, the same mixed crop did not yield so well. The field (Exp. No. 96) had not been manured for a good many years. This year it was not ploughed and was weedy with *hariáli*. The late rains delayed sowing and the conditions of cultivation were identical with those described for the previous test. 238 lbs. grain and 365 lbs. straw classes the crop as a 9-anna one.

Mr. Artal also tested a similar crop in an adjoining field (Exp. No. 97) which grows in rotation late *jowâri*, cotton and mixed wheat and safflower, with occasionally small areas of linseed, hemp and Italian millet. This field has also black soil assessed at practically Re. 1 per acre. The outturn, estimated at 7 annas, is a little less than that of the second test.

Dha'rwa'r.

Mr. Bonus' special experiment received from this district is treated as an ordinary one for reasons noted later on. The two ordinary tests from Mr. McNeill are well reported. Mr. Kánga's special test is worked out with unusual care.

Mr. A. R. Bonus, Assistant Collector,

Submits a special experiment. I can only treat it as an ordinary one. The test (No. 98) was taken on a field measuring 3 acres 15 gunthas, of which two acres were under rice and the remainder under *jowári*. The *jowári* was harvested before date of experiment and was not tested. This field was only part of a fair-sized occupancy (25 acres 15 gunthas) of which the occupant cultivates two fields as registered owner; the rest he cultivates as an annual tenant. The terms of lease are that the superior holder pays assessment and receives from the tenant half the produce. The experimenter remarks that seven different crops were grown on this particular occupancy, each ripening at a different time; consequently he thinks it impossible to carry out properly in his charge a special experiment. Special experiments when properly conducted entail in every district a good deal of painstaking trouble, and on holdings where mixed crops are invariably grown it is admittedly impossible to make an accurate special test. But in all districts representative occupancies on which a special test can be taken can be found if they are well looked for, and in any case the experimenter has the option of conducting ordinary tests instead. He could hardly expect to estimate, even approximately, the results of cultivating a 25-acre farm by an ordinary experiment on rice growing on less than $\frac{1}{12}$ of it. Drilled *somsáli* rice was grown on the field tested. The soil is fairly good blackish rice land. The field is irrigable from a tank and bears an assessment (soil and water combined) of Rs. 5-10-1 per acre. The rice land portion of the field carries rice every year. No manure was applied for this year's crop. 60¾ lbs. per acre is the reported seed rate. This for drilled rice is low. The seed was sown on 25th June and the crop ripened early in December. 721 lbs. of grain classes the outturn as an 11-anna one according to local estimate. The gross value of acre outturn at date of experiment was Rs. 21-9-9, but the rice fell in value before the date of first instalment and the crop may have realized less than the amount stated.

Mr. J. McNeill, Assistant Collector,

Conducted two crop experiments. The reports are creditable to an experimenter new to the work. They are carefully drawn up. Full information is given on nearly all points of interest. The first test (No. 99) was taken on Italian millet (*navani*). The information reported supplements that of last year's experiments on the same crop. *Navani* is essentially a light land crop

thriving with a minimum amount of soil moisture. The field experimented upon has red *masári* land and is assessed at Re. 0-7-3 per acre. This year the following crops occupied the field and the approximate area under each is noted :—

	A.	g.
Kharif jowári	11	0
Green gram (*hesaru*)	1	9
Horse gram (*hurli*)...	2	0
Castor (*audla*)	2	0
Rabi jowári (*yenigár*)	2	0
Italian millet (*navani*)	2	0

The season was unfavourable owing to deficient and untimely rain. All the crops of the district are reported by Mr. McNeill as below average. In the *navani* crop *jowári* in separate rows had been planted but failed. This indicates that *navani* thrives better than ordinary *jowári* under unfavourable conditions. One of the great advantages of the crop is that drought has a less marked disastrous effect upon it than upon any other millet. The field gets 5 loads per acre of ordinary manure every second year; none was applied this year. The field was once ploughed and once harrowed in the hot weather. The seed was drilled in July. The *navani* seed rate (9½ lbs. per acre) is more than double the formulæ but is approximately the same as that reported in a careful test taken last year. The formulæ seed rate is probably based on faulty information. *Jowári* was sown by a woman through a separate tube guided in the usual way behind the drill. A heavy harrow was used to stir the soil deeply and cover the seed. The crop was bullock hoed a month after sowing. It ripened at the end of November and yielded 226 lbs. grain and 1,625 lbs. straw per acre. The outturn is, I think, nearly correctly estimated at 8 annas. The burden of assessment is not high. The incidence in this, an unfavourable year, works out 11·68 per cent.

The second experiment by this officer consists of two tests. The crop experimented upon was sugarcane grown by two different cultivators and occupying two portions of the same survey number. A test area of 2 gunthas was selected in each patch of sugarcane; but as the terms of tenancy, the character of cultivation, and the outturn of crops differed materially, the experiment must be regarded as two distinct tests and will be treated as such. The only objection is that there is a breach of minimum test area rule.

The survey number chosen for the experiment lies at the foot of sloping ground. On the higher ground are 14 small tanks, from one of which water was obtained for the sugarcane for the first watering only. The field has good black soil assessed at Rs. 2-5-0 per acre. Two wells in the survey number, one adjacent to each plot, supply irrigation water when required. One patch measured 39½ gunthas, the other 40½. To the former 4 large cart-loads of ordinary manure were applied in January 1892, and this area was subsequently folded with sheep at a cost of Rs. 12. To the other patch 8 large cart-loads of cowdung manure were applied in January 1892. Each crop may have been benefited by the wash from the higher ground. The quantity of manure applied to the second field indicates an inferior style of cultivation. Sugarcane is a gross feeding crop and needs a heavy application of manure. The variety of cane grown is locally called *rasdáli*. The seed rate for each field is, I think, incorrectly reported; 9,000 sets per acre are reported to have been planted for one crop; 3,000 per acre for the other. The sets were planted in furrows two feet apart with a span distance between sets; about 20,000 sets per acre must have been used if planted in the manner described. The sets were planted in February and the crops were ripe in the following February. The outturn results are tabulated below :—

	Anna Estimate.	Weight of Gul per Acre.	Value of Gul per Acre.
		Lbs.	Rs. a. p.
First plot (Exp. No. 100)...	9	4,697	307 0 4
Second plot (Exp. No. 101)	4	1,835	119 15 10

According to formulæ the crops represent 16 and 9 annas outturn respectively. But the outturn formulæ for sugarcane require revision. The Khátedár is a non-cultivating Bráhman and he leases the field to two tenants on *kori* tenure. As regards the first plot the terms of occupancy were that the Khátedár gave seed and manure, paid assessment and half cost of gul-making and took half produce. The tenant is assisted by four sons, two of whom are men and two are lads; additional hired labour was required. The tillage operations were as follows:—

Grass was cut and burnt on the land in November. The field was then ploughed four times at intervals of 8 to 10 days. Clods were crushed by hand implements. Then ordinary manure was applied and afterwards the field was folded for three days with sheep. Then soil was brought from an adjoining fallow field and spread over the plot to a depth of 2 inches. The method of planting is not clearly described, but I infer that ridges and furrows were made and beds were formed by hand spade. The sets appear to have been planted in the furrows and covered by partially levelling the ridges. The field was watered from a tank immediately after planting. As soon as the shoots appeared above ground, they were earthed up by means of two joined ploughs drawn by two oxen and guided by two men, but the precise manner in which this was accomplished is not clear. The same operation was repeated when the shoots had made some growth. Meantime the crop was watered from a well by coolies using baskets. The well must be shallow, otherwise the water could not be economically raised by manual power. During the rains the water furrows were cleared, the crop hand-weeded when necessary, and the canes wrapped and tied together to prevent their lodging by rain or wind. After the rains only three waterings were given, each from the well. For expressing the juice an iron roller mill was hired at a charge of one rupee per 8 maunds of *gul* turned out. A maund of *gul* equals 25½ lbs. The cultivator owned an evaporating pan which cost originally Rs. 30. Repairs to the pan cost this year Rs. 5. The fuel used consisted of the crushed canes supplemented by about as much more got from a neighbouring village where wood fuel was used. It is not reported how the dry leaves stripped from the canes on the green tops were disposed of. The crop was protected by a brushwood fence constructed by home labour. Members of the cultivator's family in turn watched the crop. I tabulate below the cost of cultivation and differentiate between the items paid for by Khátedár and those paid for by tenant. In respect of the latter I also distinguish between household and hired labour. The labour of a man and a pair of bullocks is charged for at 8 annas per day and cooly labour, except where otherwise noted, at 3 annas each man per day.

Heads of expenditure.	Khátedár's outlays.	Cultivator's outlays.	
		Home labour.	Paid in cash.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
Cutting grass and burning rubbish; two household and two hired coolies, 2 days	...	0 12 0	0 12 0
Ploughing 4 times; 2 pair of bullocks and 4 men for 8 days	...	16 0 0	...
Clod-crushing; 2 hired coolies, 2 household men; 4 days.	...	1 8 0	1 8 0
Four cart-loads manure (8-bullock *bhandi*). Valued by cultivator at 8 annas per load; more correct valuation would be one rupee per load as carts were large...	4 0 0	...	...
Cost of haulage and spreading	...	2 0 0	...
Folding sheep and goats, 3 days; paid in kind	12 0 0	...	...
Top-dressing with soil; done by piece-work by hired coolies	16 0 0	...	...
Sets valued by cultivator at Rs. 15. Seed rate underestimated; more correct valuation would be	33 0 0	...	...
Carried forward ...	55 0 0	30 4 0	2 4 0

Heads of expenditure.	Khátedár's outlays.	Cultivator's outlays.	
		Home labour.	Paid in cash.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
Brought over ...	55 0 0	30 4 0	2 4 0
Forming ridges and furrows and making water compartments	...	1 0 0	...
Planting sets; 2 men carrying sets; 6 men planting sets; 8 men for 3 days, ½ household labour, ½ hired ...	...	2 4 0	2 4 0
Watering from tank; 2 men for 2 days...	...	0 12 0	...
Levelling ridges and covering sets; 1 man and 1 pair of bullocks, ½ day; 5 men and 5 pair of bullocks for 1 day	...	2 12 0	...
Fencing; 2 men and 2 bullocks to bring material; 4 men for 4 days constructing fence. Material cost nothing; all home labour	...	5 12 0	...
Earthing up cane 1st time; 2 men and 2 bullocks, 2 days	...	1 6 0	...
Watering from well; 5 coolies and 3 house-hold members for 3 days at 4 annas per day as work is hard ...	...	2 4 0	3 12 0
Earthing up cane 2nd time; 2 men and 2 bullocks, 2 days	...	1 6 0	...
Hand-hoeing; 4 men, 2 days	...	1 8 0	...
Miscellaneous work during the rains; hand-weeding, making water channels, &c. These operations done at odd times by home labour	...	6 12 0	...
Wrapping and tying up canes; 5 household members and 3 hired coolies for 6 days	...	5 10 0	3 6 0
Irrigation after rains; 8 men (5 hired coolies at 4 annas per day) watering crop three times at intervals from well; each time 3 days	...	6 12 0	11 4 0
Watching field; 1 man, 31 days	...	5 13 0	...
Harvesting crop and working cane-crushing mill; 8 men (3 hired coolies) for 20 days	...	18 12 0	11 4 0
4 bullocks for 20 days	...	12 8 0	...
1 man *gul*-making, 1 attendant firing furnace, at 5 and 4 annas respectively for 20 days	5 10 0	...	5 10 0
Hire of mill	11 5 10	...	11 5 10
Repairs to *gul*-making pan	2 8 0	...	2 8 0
Construction of *gurhál*, say	3 0 0	3 0 0	...
Cost of extra fuel 12 8 0			
Cost of carting same 0 11 0			
13 3 0			
Presumably this amount was paid by Khátedár as it represents value of half the fuel used	13 3 0	...	...
Haks (village dues)	...	...	5 0 0
	100 10 10	98 7 0	58 9 10
Assessment and Local Cess	2 6 3	...	...
	103 1 1	98 7 0	58 9 10

Cost of cultivation.

	For 39½ gunthas.	Per acre.
	Rs. a. p.	Rs. a. p.
Khátedár's outlays	103 1 1	104 5 11
Cultivator's cash outlays	58 9 10	59 5 8
Value of household labour	98 7 0	99 10 11
Total ...	260 1 11	263 6 6

The Khátedár's share of profit per acre is shown below :—

	Rs.	a.	p.
Half the value of *gul* per acre	153	8	2
Deduct outlay per acre	104	5	11
Khátedár's net profit per acre	49	2	3

Exclusive of household labour, the tenant's share of profit is approximately as under :—

	Rs.	a.	p.
Half value of *gul* per acre	153	8	2
Estimated value of tops and green leaves	13	1	11
Manurial value of ashes and refuse, say	8	0	0
	174	10	1
Deduct cash outlays ...	59	5	8
Net return ...	115	4	5

This amount, after covering value of household and bullock labour (Rs. 99-10-11) charged at ordinary current rates, leaves a small profit of Rs. 15-9-6 per acre.

Test on the second sugarcane patch (No. 101) gave results which are not nearly so satisfactory. This is chiefly accounted for by the fact that the cultivation was inferior and the management by no means liberal.

The field was only once ploughed and was lightly manured, 8 loads per acre only were applied. The manure was spread in the furrows immediately before the sets were planted. The field was flooded after planting in February and not again until after the rains. This information must, I think, be erroneous. After the rains the crop was watered three times by well irrigation. The method of cultivation is somewhat similar to that described for the other crop. The terms of tenancy are different. The tenant gives one-third of *gul* produced to Khátedár who only pays assessment, one-third hire of cane mill and one-third *gul*-making expenses. Without going into details it may be noted that the experimenter's figures show that although the crop was poor there was a fair margin of profit of which the Khátedár got the lion's share. The balance remaining to the tenant more than covered value of home, manual and bullock labour.

Mr. R. E. Kánga, District Deputy Collector,

Submits an elaborately reported special experiment. The selected holding consists of two fields which together measure 32 acres 9 gunthas. It bears an assessment of Rs. 44. In one field (Exp. No. 102) kharif *jowári* was the principal crop. It had subordinate to it pigeon pea and green gram ; and it is reported that rabi *jowári* and ordinary gram were also subordinate. The seeds of the two latter crops were mixed and intersown in the standing crop probably immediately after the kharif *jowari* was harvested. The manner in which the kharif crop was sown is quite clear. The seed was drilled with a four-coulter drill. In every fourth row of *jowári*, green gram and *tur* were alternately sown, so that three rows of *jowári* alternated with a mixed row of *jowári* and green gram or with a mixed row of *jowári* and *tur*. I fail to see how the experimenter could possibly apportion the area under each crop as he does, thus :—

	Acres.	Gunthas.
Kharif jowári	14	36
Tur	1	35
Green gram	1	35
Gram	...	1½
White rabi jowári	...	½
Total ...	18	28

Only the kharif *jowári* and the green gram were actually tested. The experimenter gauged the outturn of *tur* by a test taken in another field and of rabi

jowári and gram by tests reported in former years. At the best the reported figures are merely approximate. Moreover, I am suspicious of their accuracy, because the weights of the sample measure sers of grain as found in my office and as reported by the experimenter differ considerably. The difference is approximately 10 tolas on each measured ser. The kharif *jowári* stubble after harvest sent up strong vigorous shoots, which produced good heads of grain. Ordinarily there is no such produce. The first *jowári* crop was damaged by excessive late rain, whilst the second growth was benefited by the extra degree of moisture left in the soil. No test was taken on the second growth. It ripened unequally and probably it was impossible to take an experiment; still its growth must have interfered with the later rabi *jowári* and gram which were admittedly poor.

As regards the second field (Exp. No. 103) which grew wheat with subordinate rows of safflower, the tests taken no doubt represent the true outturn, unless the weighments of measured grain were inaccurate, which as already noted is possible. The season on the whole was favourable. Early *jowári* as well as wheat suffered somewhat, but safflower throve very well, so also did *tur*. The cultivator's family consists of 3 adult men and 3 adult women with two children. The grown-up members are fully engaged on the two fields. The occupant is not in debt. He is described as a well-to-do thrifty man. Last year although he had no crop he maintained his family on his reserve stock of grain. He required no Government loan and did not borrow.

The income for the year is shown as under :—

Crop.	Area.	Value per acre.	Total value on the whole area.
	A. g.	Rs. a. p.	Rs. a. p.
Jowári	18 28	17 1 7	341 7 6
Green gram... ...		1 2 7	
		18 4 2	
Wheat	13 21	20 0 0	356 2 5
Safflower		6 5 4	
		26 5 4	

The gross value of outturn of the three subordinate crops, *tur*, gram and white *jowári*, as indicated by tests on other fields, are shown thus by the experimenter :—

Crop.	Area.	Total value.
	A. g.	Rs. a. p.
Tur	18 28	46 14 0
Gram		1 9 5
White jowári ...		0 7 1
Total ...		48 14 6
Add to this the total value of the crops shown above		697 9 11
Total gross value of outturn ...		746 8 5

The experimenter calculates the cost of keeping a pair of bullocks for a year assuming that they will eat per day 30 lbs. *kadbi* and 4 lbs. chaff. This quantity is not sufficient, although probably the ordinary work cattle of the country live on less when the stall feeding is supplemented by grazing.

According to the experimenter's estimate we have to deduct from the gross produce :—

Items.	Value. Rs.	a.	p.
Fodder for 2 work bullocks during year	31	0	5
Cotton seed for ditto when at hard work	7	8	0
Value of seed sown	14	8	11
Haks paid to Balutedárs	2	9	0
Assessment	44	0	0
Local cess	2	12	0
Interest on capital and depreciation of live and dead stock, say.	*15	0	0
Total ...	117	12	4

* The experimenter's estimate is Rs. 9 for depreciation only.

The cultivator owns a milch buffalo which with a heifer calf eats as much food and fodder as the work bullocks do. But this is not charged for, because the whole of the milk is used in the household, and the value of the milk should at least balance the cost of keep. All the labour was home labour. Extra bullocks are at times borrowed on the usual give-and-take system.

Irrespective of the value of home labour and of home expenditure (the latter estimated by experimenter at Rs. 155-10-8) the balance sheet stands thus :—

	Rs.	a.	p.
Gross value of produce	746	8	5
Deduct cash outlays, keep of bullocks, seed and dues detailed above	117	12	4
Probable income ...	628	12	1

The experimenter concludes "that a family consisting of eight members can comfortably live on about 32 acres of land in ordinary times, can make a good saving in favourable years, and can hold its own against bad times."

Each crop tested for this special experiment is briefly referred to in the remark column of the tabular summary.

Kolaba.

Mr. DuBoulay did not join the district till after the kharif harvest was over and was on survey duty during the major portion of the rabi season. He had little field to choose from and his tests being on very poor crops had to be rejected (Standing Orders, Rule 4). Mr. Bhángaonkar forwards a special as well as an ordinary test which are detailed below.

Mr. J. H. DuBoulay, Assistant Collector,

Explains that he did not join the district until the kharif crops were cut and was learning classing at the ordinary time of rabi harvest. Consequently there were only a few crops to select from, and these did not represent an average of the district. The Collector thinks Mr. DuBoulay's explanation should be accepted. The two tests submitted, one on mixed *tur* and *vál* and the other on *vál* alone, both second crops in rice land, have no practical value and they are not reported. The season is alleged to have been as "bad as it could be" for rabi crops, but this allegation is not supported by rainfall statistics. The outturn of the mixed crop hardly equalled the seed said to have been sown, while that of *vál* alone was not more than a fourth part of it. The first crop was worth Rs. 2-3-5, the second Re. 1-2-9 per acre. The crops were abnormally poor and as such should, by standing orders, not have been selected for test.

Mr. K. N. Bhángaonkar, District Deputy Collector.

I cannot accept this officer's special test as such. It affords useful information as an ordinary experiment and is treated as one. The occupancy tested consists

of four pot numbers of three survey numbers. Two of the pot numbers have first-rate rice land, the other two are *varkas* land and are not under tillage. The occupant rents and, assisted by his wife and a hired servant, cultivates in addition to his own land one acre of rice land and half an acre of *varkas*, the profits from which were not gauged by actual test but taken on hearsay evidence.

In summarizing the results of the experiment (No. 105) it has to be noted that the pot number of one survey number carries an assessment of Rs. 6-12-2 and that of the other Rs. 6-11-10 per acre. Thus they are practically assessed at the same rate, and although the experimenter does not differentiate between the returns from each, it is fair to assume that the test areas which together measured 10 gunthas gave a fair average of the whole.

The soil is known as *garvi, i. e.*, first class rice land in contradistinction to *nim garvi, i. e.* middling, and *halva, i. e.* inferior or third class. The experimenter's report shows that inferior rice land needs at least 80 lbs. per acre seed whilst half that quantity will suffice for *garvi* land.

The fields carry rice every year and no second crops are taken. This year, although the rainfall was heavy, it was not well distributed. Early showers were scant and on the whole the season was not favourable. The crop was a transplanted one. The field was not manured but the seed-bed was liberally rábed. An eight-guntha seed-bed is said to have supplied seedlings for 1 acre $1\frac{1}{4}$ guntha. On such land this proportionate area of nursery is high. The seed rate was $49\frac{1}{2}$ lbs. per acre. The crop estimated as an average one produced 2,129 lbs. grain and 2,004 lbs. straw per acre, worth together Rs. 57-14-4. A suspicion of inaccuracy attaches to the test, because the sample measure of grain (one *adholi*) sent to my office weighed $134\frac{3}{4}$ tolas, whereas it is recorded by the experimenter as 111 tolas. Reference to the experimenter has not made clear whether more than the exact contents of an *adholi* measure was sent as sample. It is probable that such was the case, and on this assumption the test is reported.

This officer submits a second rice experiment (No. 106) taken on middling rice land *(nim garvi)* assessed at Rs. 5-3-10 per acre. In this experiment the sample forwarded to my office was stated to be $1\frac{1}{4}$ *adholi* exactly. It was found to weigh $133\frac{1}{2}$ tolas. This is equivalent to $106\frac{4}{5}$ tolas per *adholi* as against 114 tolas recorded by experimenter. By reference it has transpired that the *adholi* is the lowest correct measure of the district, and although measures of a lower standard are in use it would have been practically impossible to send as a sample $1\frac{1}{4}$ *adholi exactly*. The weight recorded by the experimenter may be correct, but I report the experiment with some misgiving, particularly as the *adholi* of grain of this crop weighs three tolas more than the same measure of grain of the other rice crop tested by this officer, while the sample of the latter is admittedly the better of the two. The crop was transplanted rice. The seed sown in June was transplanted in July. The seed rate comes to $55\frac{1}{2}$ lbs. per acre. The less productive portions of the field were directly manured and the seed-bed liberally rábed with cowdung. A 5-guntha seed-bed could hardly have produced seedlings sufficient for the field 1 acre $32\frac{1}{2}$ gunthas. The crop under good cultivation was ripe early in November. Estimated at 12 annas it yielded 1,581 lbs. grain and 1,560 lbs. straw. The percentage incidence of assessment works out 12·84.

Ratna'giri.

The programme settled for this district was fully carried out, Messrs. Panse, Crump, and Ghaisás submitting 3 ordinary tests each on the following crops :—

	Rice.	Vari.	Nágli.	Harik.
Mr. Pánse...		1	1	1
Mr. Crump	2	...	1	...
Mr. Ghaisás	1	1	1	...

Mr. G. D. Pánse, Assistant Collector,

Submits three tests with voluminous explanatory notes which deserve careful analysis. The crops experimented upon are *vari, nágli and harik*—three coarse millets which are extensively cultivated in the uplands of the Konkan. The information afforded by Mr. Pánse's experiments goes to augment in a sub-

stantial degree that recorded in respect of these grains during the past two years. The experimenter refers in a pointed manner to the backwardness of the people and the district. This he thinks is borne out because (1) the food of the people consists mainly of these coarse grains, (2) the people are poorly clad and (3) their homes do not indicate prosperity. The average rate of pay for unskilled labour, *viz.* 1¼ anna per day for a man, is a significant indication of the position of the poorer classes. The amount would barely support existence in more advanced districts. There is nothing in Mr. Pánse's crop tests to show that an inadequate return is got from the land. On the contrary the yields vary from fair to good. It is known that there is sufficient available land to admit of the universal practice of allowing fields to lie waste or fallow to recover fertility, when five or more years' cropping has exhausted them. The rainfall is abundant and assured, and the Government assessment is often only a few annas per acre. A hereditary system of tenure, however, prevails in the district to which much of the poverty may be attributed.

The Khots are middlemen who pay the Government assessment and exercise landlord's rights over village lands. They exact as much as they can from tenants, that exigible being fixed by custom or agreement. The tenants are essentially tenants-at-will. The Khot participates in improvements made by a tenant, and cultivators have, therefore, no encouragement to improve their holdings even if they had the means. An appraisement system (*abhávani*) prevails by which Khots fix the proportion of the crop due as rent. This system is to be deprecated. Mr. Pánse notes that the survey numbers are sub-divided into *phálni* numbers. Each of the latter is embanked to impound rain water. The soil varies in depth from 9 to 12 inches.

Vari formed the subject of the first test (No. 107). The crop was raised from rábed transplanted seedlings. On the seed-bed cowdung, branchwood (*kaval*) and grass were burnt. The seed was broadcasted on the ashes. One turn of the plough sufficed to cover the seed. The soil was subsequently smoothed and levelled by hand implements. On two and a half gunthas of seed-bed 5 sers (about 4$\frac{1}{10}$ lbs.) of seed were sown broadcast in June. The seed rate per acre works out about 2$\frac{2}{3}$ lbs. The seedlings were ready in a month, and were sufficient for the transplantation of an area of 1½ acre. The field meantime had been four times ploughed with a light plough. The crop was once hand-weeded. The rainfall was more than ordinary and the rain damaged the quality, but did not diminish the outturn of the crop. The crop was ripe on the 10th of November. It was estimated at 14 annas and yielded 1,050 lbs. grain and 1,333 lbs. straw, which had a gross value of Rs. 29-11-5 per acre. *Dhamni* was the variety of *vari* grown. There are other two sorts grown in the district, *viz.* *halvi* and *dudhavra*. *Vari* straw like that of *harik* is not used as fodder and has no commercial value except as rább material.

The soil is decomposed laterite and the field is assessed at Re. 0-5-11 per acre. It carries the following sequence of crops after a five years' fallow :— 1st *kulthi*; 2nd *sarvat* rice; 3rd *vari*; 4th *harik*; 5th *til*.

On land assessed at a slightly lower rate (Re. 0-4-3) per acre *nágli* (Exp. No. 108) did not yield so well. The crop was also grown from transplanted seedlings, raised on a rábed seed-bed. The seed was broadcasted in the seed-bed early in June. About 4 lbs. seed sown in 1$\frac{1}{7}$ guntha gave seedlings sufficient for an acre. Six weeks after sowing the seedlings had grown sufficiently to be transplanted into land which had previously been five times ploughed. The subsequent cultivation was identical with that described for *vari*. 829 lbs. of grain and 767 lbs. straw per acre classes the crop as a 12-anna one. The gross value per acre amounts to Rs. 25-6-0. The grain was worth 34$\frac{1}{3}$ lbs. per rupee as against 36 lbs. per rupee of *vari*. *Nágli* straw, although a coarse food, has a recognised fodder value. The incidence of assessment in this test as well as in the previous one is low. There are discrepancies in regard to acre seed rates and ratio of seed-bed to acre of transplantation between the figures recorded this year and in former years. If special attention is given to these points in any future tests taken the figures recorded will either be verified or proved to be wrong.

Mr. Pánse remarks that many kinds of *nágli* are cultivated and enumerates twelve kinds grown in his district; *viz sarvi, khandála, sohábe, ganeshi, halva, parva, mahán, gowri, dhatal, mhádi, mithgori,* and *satki.*

Harik was also tested (No. 109) by this officer. This crop is grown usually in the 3rd or 4th year of the rotation and after the land has become too exhausted to grow rice, *nágli* or *vari.* Consequently the cultivator expects a moderate return and in the present instance was probably satisfied. The cost of cultivation on the field experimented upon bears a fair ratio to the outturn. The seed was broadcasted directly in the field where the crop matured. No manure was applied. The land was ploughed twice and the crop hand-weeded once. 24½ lbs. per acre seed broadcasted in June produced a mature crop early in November, which was estimated at 12 annas and yielded per acre 785 lbs. grain and 2,143 lbs. straw, worth together Rs. 7-14-7. The season is described as good and the cultivation fair.

Mr. Pánse refers to the narcotic principle which *harik* sometimes contains thus: "After *harik* is brought home by the cultivators, they have to make a dangerous experimental trial on a poor person of its intoxicating properties. *Harik* is generally found to be *májre, i.e.,* intoxicating. In order to free it from its poisonous effect it has to be washed with cow-dung and after this tedious operation it becomes eatable."

Mr. L. C. Crump, Assistant Collector,

Reports three tests, two on rice and one on *nágli.* The first rice crop (Exp. No. 110) yielded unusually well for a crop classed as an average one. The outturn, *viz.,* 3,553 lbs. grain and nearly three tons of straw per acre, exceeds the bumper standard according to the formulæ. The field is admitted to be one of the best in the village. Only the best fields remained unharvested when the experimenter got into the district and the crop selected must not, therefore, be considered anything near an average. The owner cultivated his field well. In a favourable season he would of course expect good results from 1st class rice land assessed at Rs. 9-8-11 per acre. The gross outturn is put down as worth Rs. 120-11-3, but I consider the straw and by-product overestimated at Rs. 20 per acre.

The crop was transplanted rice. The seed (66 lbs. per acre was the seed rate) was broadcasted in June in a seed-bed which was rábed with cowdung and dried grass and the seedlings were ready in July. An 8-guntha nursery was reported sufficient for one acre of transplantation. The crop was ripe in November. The percentage incidence of assessment works out 7·91.

Similar rice *patni* on 2nd-class rice land assessed at Rs. 4-8-5 per acre did not yield nearly so well (Exp. No. 111). This crop was also estimated as average. It was transplanted rice. The seed-bed was rábed with cowdung, dry grass and leaves but not in the same liberal manner as that of the 1st crop tested. A 16-guntha seed-bed (as against an 8-guntha seed-bed in the first test) was required for an acre of transplantation. Both nurseries were larger than usual. I doubt the accuracy of the stated proportionate area of seed-bed to field in the second test. The seed rate (76 lbs. per acre) is probably nearly right. The outturn was 1,185 lbs. grain and 2,740 lbs. straw. The grain was worth 39⅔ lbs. per rupee as against 35¼ lbs. in the first test. The bushel weight of grain in husk was in each case the same, *viz.* 48½ lbs. In this test the percentage incidence works out 13·40. The inference is not that the burden of assessment is high but that the method of cultivation was not good.

Nágli, the first crop taken after a four years' fallow on sloping *varkas bharad* land (Exp. No. 112) gave fair results. The field is assessed at Re. 0-3-6 per acre and during the rotation *nágli,* rice, *til* and *kodra* follow each other. As usual the crop was a transplanted one. On the seed-bed was burnt a fair quantity of cowdung, branch-wood and dried grass. Eight gunthas of seed-bed are said to have provided seedlings for an acre. The seed rate (6⅔ lbs. per acre) is about average. The grain worth 37½ lbs. per rupee gave an acre return of Rs. 15-2-10, whilst the straw as fodder was estimated to be worth Re. 1-9-0 per acre. The produce from the test area shows an acre outturn of 567 lbs. grain and 860 lbs. straw; which according to local opinion is held to represent a 13-

anna crop; heaps of stones and rubbish occupied part of the test area. This, the experimenter remarks, is a necessary incident in the cultivation of hill millets.

Mr. K. V. Ghaisás, District Deputy Collector,

Furnishes three crop tests, one on rice, one on *nágli* and one on *vari*. The first test (No. 113) rice, was taken on land assessed at Re. 1-11-8 per acre. The field was originally *varkas* land. By a considerable outlay in levelling and embanking it has been converted into rice land. The cultivation of rice in such fields is precarious except when rain is timely and abundant; and the method of growing the crop tested would have added to the risk. Early rain held off and although there was sufficient for ploughing early in June, there was not enough for sowing until the end of that month. Meantime the soil was properly tilled and a light dressing of manure (refuse and cowdung) was given. The seed was broadcasted directly on the field. Seed which had been sprouted by artificial means was used. This is a risky plan, except when there is a continuous downpour immediately after sowing. Late rains were abundant and the season was on the whole favourable. 78½ lbs. of seed per acre, sown at the end of June, produced a mature crop at the end of October, which was estimated at 18 annas and yielded 956 lbs. of grain and 1,970 lbs. of straw. The bushel weight of grain in husk was 48 lbs. The grain sold at 43 lbs. per rupee. The variety grown is inferior rice called *bárik vánksál*. The incidence of assessment works out 6·80 per cent. which is moderate.

Nágli (Exp. No. 114) was tested by this officer. The crop was grown from transplanted seedlings which were raised on a seed-bed, on which 20 head-loads of cowdung, 30 head-loads of branchwood (*kaval*), 2 head-loads of *harik* straw (*hárken*), and 40 bundles of hay were burnt. A 5-guntha seed-bed sufficed for an acre of transplantation. The field is *varkas* land assessed at 2 annas 7 pies per acre. It is allowed to lie fallow for 8 or 10 years. The soil which is poor is known as *bharad dongri*. The ordinary rotation is not recorded. Presumably the crop tested was the first taken after a long fallow. The field was seven times ploughed while the seedlings were growing. The seed rate works out 13¾ lbs. It is known that poor *varkas* land requires a higher seed rate than good land. Still I think the rate is high. About the middle of July the seedlings were transplanted into holes made two or three inches apart by a pointed pole. These holes were half filled with dried pieces of fish as manure. 783 lbs. grain and 1,225 lbs. straw per acre, having a gross value of Rs. 23-7-10, was locally estimated as a 17-anna crop.

Vari (Exp. No. 115) on better *varkas* land yielded fairly well. The crop appears to have been the third taken after a 10 years' fallow, the two previous crops having been *harik* and *nágli*. The *vari* was grown from seedlings raised on a well rábed seed-bed, and were transplanted early in July. The seed was broadcasted early in June. The seed rate was 4 lbs., and 6¼ gunthas of nursery furnished seedlings sufficient for an acre of transplantation. The main field was three times ploughed but no manure was applied. Rain, falling when the crop was ripe, delayed harvest some days and some of the grain was shed; but there was no material loss. The crop was locally estimated at 15 annas and produced 699 lbs. grain and 985 lbs. straw per acre.

Ka'nara.

Mr. Divátia could conduct only one experiment on rice owing (1) to his detention at head-quarters, (2) exigencies of tour, and (3) his absence on privilege leave. Mr. Hudson submitted three tests on rice as required. Mr. J. L. Lushington, Divisional Inspector, Land Record and Agriculture, forwards a test on *vaingan* rice from this district.

Mr. N. B. Divátia, Assistant Collector,

Reports fully one rice test. The crop (Exp. No. 116) was inferior broadcasted rice sown in June and reaped early in November. 179½ lbs. of seed appears to have been sown per acre. This is a high seed rate. Several varieties were grown in the field and two occupied the test area. The experimenter classes them as one sort, as they had both the same market value, 46 lbs. per rupee. The

field has red soil assessed at Rs. 5 per acre. 1,303 lbs. of grain per acre according to local opinion is a 12-anna crop. It is considerably higher than the formulæ estimate. The incidence works out 16·96 per cent. This is high and is partially accounted for by excessive late rains which damaged the crop and by indifferent cultivation. Before sowing a light dressing of manure was given to the field.

Mr. C. W. Hudson, Assistant Collector,

Submits three crop tests with full and interesting notes. It was feared that two of the experiments had been vitiated by the experimenter's failure to correctly measure the test areas. The mistakes arose because a cross staff was not used and these areas were not parallelograms. Mr. Hudson believes that he has been able by remeasuring to make the necessary corrections. On this supposition the tests are reported.

The first experiment (No. 117) was made on broadcasted rice grown as a rain crop. The field can be watered from a water-course which runs through it, but this year the rains were sufficient early in the season for the requirements of the crop and were more than sufficient as it ripened. Heavy rain late in October washed the grain out of the ripe ears and the outturn was thus considerably lessened. The field grows rice every year for four years and sugarcane in the fifth. It is good rice land and bears an assessment of Rs. 4-15-0 per acre. The manure was applied in April at the rate of 300 head-loads, equivalent to about 19 cart-loads per acre. It was composted material consisting of leaves, ashes, husks, stable litter and cowdung. The seed rate (160½ lbs. per acre) is rather high even for broadcast rice. The experimenter remarks that even this is lower than the usual rate on the coast of Kárwár táluka, one *kolaga* per guntha or 183 lbs. per acre being sown. 2,233 lbs. grain and 3,701 lbs. straw was considered an average outturn from the field. It is much above that standard according to the formulæ. The seed was sown at the middle of June, and the crop was harvested early in November.

Mr. Hudson's second test (No. 118) was taken on the best rabi rice he could find. The crop was raised on land which has grown double rice crops since 1888. The variety grown as a second crop is a red rice called *kempi*. If grows quickly and is preferred to another local white variety *kabaga*, because the latter requires more water and cannot stand drought. Moreover, the *kabaga* variety although it yields well requires to be half boiled before it is husked and weight for weight is not so valuable as *kempi*. The field has a good clay soil. It bears an assessment of Rs. 5-2-11 per acre. The land is low-lying and is watered or kept moist by springs situate a mile above and which afford sufficient water for 200 acres. The water distributes itself more or less. The field was lightly manured with cowdung and forest leaves about the beginning of December. This year for the kharif crop leaves only were applied. The crop suffered slightly from too much water. This was the flood water from heavy late rains. Estimated at the average standard the crop produced 2,640 lbs. grain and 2,990 lbs. straw per acre, worth together Rs. 60-13-3. The seed rate (188 lbs. per acre) appears high, but Mr. Hudson made special enquiry on the point, and it is quite clear that broadcasted rice needs in the district a high seed rate, and if grown in the rabi season, 1½ to 2 times as much seed is sown as in the rains.

Mr. Hudson's second and third tests may be contrasted with each other and with Mr. Lushington's (No. 120). *Vaingan* or rabi rice was in each case the subject of experiment. The field of the third test (No. 119) is specially well situated for growing a rabi rice crop. It carries two rice crops every year. It lies in a depression between two small hills. A streamlet running through it gives sufficient water for 20 acres of late rice. This year's crop estimated at 20 annas was the best got during the last ten years. The field was well weeded and well manured. The soil is very good though not faultless, and is retentive of moisture without being sticky. It bears an assessment of Rs. 4-2-9 per acre. The manure consisted of leaves gathered in the forest and cowdung composted together. The seed, 205 lbs. per acre sown broadcast, produced a ripe crop in the middle of April which yielded 2,250 lbs. grain and 3,433 lbs. of straw per acre, together worth Rs. 53-4-6. The crop is admitted to be the best if not one of the best in the district.

Mr. J. L. Lushington, Divisional Inspector, Land Records and Agriculture, S. D.,

Submits an interesting test (No. 120) on *vaingan* or hot-weather rice, which is grown in the field experimented upon every year as a second crop after *sarad* or rain rice. *Sorta* was the variety grown. It is the usual sort for hot-weather sowing. Two-third only of the field grows the second crop, for which irrigation is of course indispensable, and is provided by a flow channel from a perennial stream. The crop was a transplanted one. The seed-bed was manured with 7 tons ordinary manure per acre; the rest of the field with 4½ tons per acre. The rain crop was unmanured. The seed rate, 134¾ lbs. per acre, cannot be compared with any authentic formulæ. It is less than that reported by Mr. Hudson for rice similarly grown. The seed broadcasted in December furnished seedlings which were ready for transplanting in January. The crop ripened early in May. A 5-guntha seed-bed gave seedlings sufficient for an acre of transplantation. The field was four times ploughed and twice harrowed. Two test areas were taken. Unfortunately it was subsequently found out that one of them formed part of the seed-bed.

The nursery although not transplanted was more liberally manured than the main portion of the field, and it produced a better outturn of grain, but less of straw than the other patch tested. The crop was locally estimated at 13 annas. Yet it produced 2,284 lbs. of grain and 4,128 lbs. straw. The latter figure does not represent the weight of dry straw, as the crop was threshed immediately it was harvested. The threshing was managed in rather a novel way. The grain was trampled out under men's feet. The deft use of the feet separated the grain in the most thorough manner. The action resembled that by which grain is separated from an ear by rubbing in the palm of a hand. The grain was saleable at about 46 lbs. per rupee. This is a low rate and is partially accounted for by the fact that there is no local bazár and the produce of the district is bought up by wandering Goanese traders who carry it below the ghâts for resale.

The acre value of gross produce of the field comes to Rs. 60-8-0 and the percentage incidence of assessment works out 4·04. The burden of assessment is undoubtedly low. The rating of water is particularly so. This Mr. Lushington thinks is presumably due to the backward condition of the people (the results of this experiment show no backwardness in successful cultivation) and the scarcity of labour in the district.

The field is worked by a tenant on the half-share system. The occupant supplies seed, plough cattle, manure and implements; the tenant does all labour. Assessment is paid by the occupant, who receives seed and half the produce; tenant the rest.

J. W. MOLLISON,
Superintendent of Farms,
Bombay.

TABULAR SUMMARIES.

LIBRARY
OF THE
BOMBAY
BRANCH
OF THE
ROYAL ASIATIC SOCIETY.

Summary of Crop Experiment Reports,

O. S. = Original Survey ;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	AHMADABAD.									
	Mr. G. S. Curtis, Assistant Collector.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
1	Daskroi (Barámpur) ...	Rice (Sutarsál), 30th October 1892.	16	2,100	8½	1,386 with husk.	615	36 5 6	2 14 7 R. S.	8·01
2	Parántij (Poglu) ...	Wheat (Vájia), March 1893.	16	1,425	143	1,962	2,000	68 3 10	2 7 0 R. S.	3·57
	Mr. J. K. N. Kábráji, Assistant Collector.									
3	Viramgám (Hásalpur-Sareshar).	Cotton (Vágadia) 13th and 23rd April 1893. Two pickings.	16	420	25½	444 Pod cotton.	...	27 11 1	1 0 7 R. S.	3·74
	Mr. Motilál Chunilál, District Deputy Collector.									
4	Dholka (Saroda) ...	Rice, (Kamod), 2nd December 1892.	9	1,095	9¼	1,067 with husk.	768	38 2 5	11 14 1 R. S.	31·14
5	Sánand (Daran) ...	Do. do. 7th December 1892.	14	1,750	10	1,629 with husk.	2,360	61 15 5	3 10 2 R. S.	5·86
	KAIRA.									
	Mr. H. R. Cooke, Collector.									
6	Thásra (Jalánagar) ...	Gram (Dabhoi Chana), 25th February 1893.	12 to 14	505 to 590	35	907	...	23 9 11	5 7 0 O. S.	23·02
	Mr. H. S. Lawrence, Assistant Collector.									
7	A'naud (Boriávi) ...	Rice (Sutarsál), 11th October 1892.	12	1,460	33	1,596 with husk.	1,850	45 2 8	10 15 2 O. S.	24·24

Northern Division, 1892-93.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
.0 4	40 weight.	41	$2\frac{1}{6}$	*Experiment No. 1.*—Rice, *sutarsál*, on medium *gorádu* soil manured with $8\frac{1}{2}$ cart-loads of cowdung per acre and irrigated from the Chándola tank at a charge of Rs. 7 per acre. Rice grown on part of the field and *bájri* alone or with *tur* on the rest. Cultivation indifferent and rain being excessive in the beginning is said to have damaged seedlings. Area of seed-bed not ascertained. Seed rate low. Though reported at 16 annas the yield less than 11 annas if compared to the formulæ.
0 8	Do. ...	$29\frac{2}{3}$	$7\frac{1}{7}$	*Experiment No. 2.*—Wheat, *vájia*, on similar land equally manured. Only one crop usually taken, but this year owing to abundant moisture and plenty of water in the well a second crop after rice was raised. Tillage fair. Crop affected by rust owing to cloudy weather and rain in January-February. This lowered its quality. The yield, however, represents, according to the formulæ, a bumper outturn. Incidence (col. 11) on second crop only.
4 33	Do. ...	16	...	*Experiment No. 3.*—Cotton, *vágadia*, on red *gorádu* soil heavily manured this year with 30 cart-loads per acre of cowdung and rubbish, the accumulation of 5 or 6 years. *Bájri* and cotton grown in alternate years. Tillage good. Field occupies rising ground and escaped the general injury from excessive moisture from which crops suffered all over. Seedlings from first sown seed got burnt probably on account of high dressing of manure; seed had to be sown afresh. Crop much above the average of the locality (8 annas).
0 10	Do. ...	$29\frac{2}{3}$	3	*Experiment No. 4.*—Unmanured and unirrigated rice, *kamod*, on *bágáyat bhátha* deep sandy land, once the bed of the Sábarmati, converted into rice land. Rotation:—(1) rice and *banti*, (2) rice and sugarcane, (3) sugarcane. Season not favourable, the crop having suffered from excessive moisture. Area of seed-bed to an acre of field 6·3 gunthas, high; and seed rate, compared to the formulæ (15 lbs.) low. Seed-bed irrigated 12 times. Yield below average of the táluka. Incidence high, but the cultivator intended raising a second crop which would help to lower it.
0 10	Do. ...	$29\frac{2}{3}$	3	*Experiment No. 5.*—Same crop grown continuously on *kiári* land manured with 8 cart-loads of ordinary manure per acre. Season, &c., as above. Area of seed-bed 7·2 gunthas per acre. Seed-bed irrigated 10 times and the whole field three times from a neighbouring tank.
0 8	Do. ...	$38\frac{1}{2}$	...	*Experiment No. 6.*—Gram, a second crop on *besar* rice land, growing rice always and gram only once in four or five years when season allows. Field manured with 10 cart-loads of cattle droppings and ashes for rice, but not for the second crop. Season exceptionally good and crop full bumper though estimated at 12 to 14 annas only. Incidence on second crop only.
0 4	Do. ...	38	$4\frac{7}{8}$	*Experiment No. 7.*—Rice, *sutarsál*, on highly assessed *kiári* land liberally manured with 30 cart-loads of farm-yard manure per acre and growing apparently rice followed by a second crop of pulse every year. Field irrigable from an adjacent tank, but no watering was necessary this year owing to abundant rainfall. The field being on high level escaped injury from floods. Tillage careful. Incidence of assessment on first crop only.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	KAIRA—*continued.*									
	Mr. H. S. Lawrence, Assistant Collector—contd.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a.	Per cent.
8	Thásra (Wanoti) ...	Eleusine coracana (Bávto), 25th October 1892.	8	640	6½	582	375 bundles.	15 7 0	3 0 0 O. S.	19·43
9	Do. (Dhándi) ...	Paspalum scrobiculatum (Kodra), 27th October 1892.	6 to 7	390 to 460	28	591	...	12 9 8	2 14 8 O. S.	23·14
10	Kapadvanj (Sikandarporda). *Mr. Bamanji Edalji Modi, District Deputy Collector.*	Do. do. (Kodra Mitha), 30th October 1892.	14	790	20½	532	...	11 5 9	1 5 6 O. S.	11·83
11	Mátar (Mátarpura) ...	Rice (Kamod), 23rd November 1892.	18	2,625	11	1,288 with husk.	1,992	48 15 7	9 9 2 O. S.	14·09
12	Do. do. ...	Wheat (Kátha), 16th March 1893.	16	1,500	90	517	897	18 15 4	Do. ...	
13	Do. (Kanera) ...	Rice (Kamod), 23rd November 1892.	18	2,625	8	1,042 with husk.	1,672	39 10 11	3 5 4 O. S.	8·40
14	Do. (Pansoli) ...	Do. (Jirásál or Jhini) 18th November 1892.	18	2,625	8	1,337 with husk.	2,112	42 12 0	10 14 11 O. S.	25·57
15	Do. (Wansar) ...	Do. (Sutarsál), 25th October 1892.	18	2,625	10	1,600 with husk.	2,136	36 2 0	7 8 0 O. S.	20·76

Northern Division, 1892-93.—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 8	40 weight.	41	306 bundles.	*Experiment No. 8.*—*Bávto* on indifferently cultivated *gorádu* soil manured with $10\frac{2}{3}$ loads of farm-yard manure per acre. Rotation:—(1) *bájri*, (2) *kodra* and (3) *bávto* with subordinate mixtures in each. Season poor for this crop, excessive rain having done considerable damage. Seed sown in a seed-bed (proportionate area of which unkown); half the seedlings withered for want of early rain. Crop not more than 6 annas when compared to the formulæ High percentage of incidence due to poor outturn.
0 8	Do. ...	47	...	*Experiment No. 9.*—*Kodra* with subordinate mixtures on *gorádu* soil manured with 12 cart-loads of farm-yard manure per acre. *Bávto*, *kodra* and *bájri* grown with subordinate mixtures during the past three years. Crop damaged by excessive rain and tillage bad. Outturn poor; subordinate crops not tested. Seed rate double the formulæ.
0 8	Do. ...	47	...	*Experiment No. 10.*—*Kodra* as a sole crop on similar soil equally manured. Land brought under cultivation two years ago and grew *kodra* each year since. Season as above. Crop much over-estimated at 14 annas, the outturn, compared to the formulæ, being nearly 9 annas.
0 5	Do. ...	$27\frac{1}{5}$	$9\frac{1}{2}$	*Experiment No. 11.*—Rice, *kamod*, on saltish *besar* rice land manured with 17 cart-loads of ordinary manure per acre and growing rice followed by wheat every year. Field irrigable by a flow from the Khári Canal, but not watered this year owing to abundant rains. Proportionate area of seed-bed not ascertained. Cultivation good, but season somewhat unfavourable, excessive late rains affecting the crops rather injuriously. Crop much over-estimated being only 9 annas according to the formulæ.
0 8	Do. ...	$29\frac{1}{5}$	$6\frac{3}{7}$	*Experiment No. 12.*—Wheat, *kátha*, on the above field without manure. Late rains favoured the growth of rabi crops in general, but showers in February caused mildew. Crop irrigated from the Khári Canal, but extent of irrigation not stated. Outturn poor and represents according to the formulæ only a 5 to 6-anna crop.
0 5	Do. ...	$27\frac{1}{5}$	$9\frac{1}{2}$	*Experiment No. 13.*—Rice, *kamod*, on saltish inferior *besar* soil manured with 22 carts per acre of ordinary manure applied before the rains. Seeds artificially sprouted before being sown in the seed-bed, area of which not known. Seed rate low. Other remarks as in No. 11. Compared to the formulæ, outturn in column 7 less than 8 annas.
0 5	Do. ...	$32\frac{3}{4}$	$9\frac{3}{7}$	*Experiment No. 14.*—*Jirásál* rice on good *besar* land manured with 17 cart-loads per acre of manure and growing as above rice and wheat every year. Other conditions same as above. Yield 9 anhas according to the formulæ. Incidence of assessment on the first crop alone.
0 5	Do. ...	$46\frac{7}{8}$	$9\frac{3}{7}$	*Experiment No. 15.*—Rice, *sutarsál*, on the same kind of land manured with 18 cart-loads of ordinary manure per acre. Rice is followed by wheat every year. Unsprouted seed sown in the seed-bed. Proportionate area of seed-bed given at about 10 gunthas per acre is more than sufficient. Seed rate low. Field irrigable from a well, but no irrigation required this year. Season, &c., as above. Outturn, compared to the formulæ standard, 12 annas. Incidence in column 11 will not appear so high when the value of the second crop is taken into consideration.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	
	KAIRA—*continued.* *Mr. Bamanji Edalji Modi, District Deputy Collector*—continued.		Annas.	Lbs.	Lbs.	Lb.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
16	Mátar (Sokhda) ...	Rice (Sutarsál), 28th October 1892.	20	3,000	10	2,470 with husk.	4,754	57 2 10	7 8 0 O. S.	13·11
17	Do. (Kájipará) ...	Wheat (White), 12th March 1893.	18	1,750	75	507	565	18 6 7	6 5 6 O. S.	34·56
18	Do. (Navágám) ...	Do. (Dáudkháni), 14th March 1893.	18	1,750	83	405	435	14 5 8	10 14 6 O. S.	75·99
19	Do. (Kanera) ...	Do. (Kátha), 16th March 1893.	20	2,000	100	897	1,112	32 7 8	9 2 0 O. S.	28·09
20	Borsad (Singláo) ...	Grani, 1st February 1893.	20	900	27	1,194	...	28 3 1	7 9 4 O. S.	26·89
21	Mátar (Kájipara) ...	Do. 12th March 1893.	18	790	35	343	...	7 13 7	6 5 6 O. S.	80·82
22	Do. (Kaloli) ...	Do. 20th March 1893.	20	900	43	1,238	...	28 4 10	3 5 4 O. S.	11·77
23	Mehmadabad (Chhápra).	Paspalum scrobiculatum (Kodra), 2nd November 1892.	20	1,600	13	807	...	16 9 7	3 3 4 O. S.	19·32
24	Do. (Mehmadabad).	Do. do. 9th November 1893.	19	1,500	12	868	...	17 13 6	6 6 10 O. S.	36·01

Northern Division, 1892-93—continued.

R. S.= Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 5	40 weight.	46 7/8	9 3/7	*Experiment No. 16.*—Land most liberally manured with 30 cart-loads of ordinary manure and 3 cwts. of castor cake per acre. Outturn in consequence much better than in any of the above tests and represents a 17-anna crop. Other conditions same as in Experiment No. 15.
0 8	Do. ...	28 3/8	8	*Experiment No. 17.*—Irrigated wheat on unmanured *besar* rice land growing usually rice followed by wheat, barley or gram. Rice sown on only half the field this year owing to deficiency of water and wheat raised mostly on the unsown area. Excessive moisture did not permit sowing before the middle of December. Crop watered once from a well in the field. Yield much overestimated at 18 annas being hardly 9 annas according to the formulæ standard. Incidence very high, partly due to late sowing.
0 8	Do. ...	29 1/5	8 2/7	*Experiment No. 18.*—Wheat, *dáudkháni*, taken as a second crop on good black rice land growing rice followed by wheat or barley or both every year. Land manured for rice with 14 cart-loads per acre of ordinary manure. Crop sown very late and irrigated only once from the Khári Canal. Outturn poor, less than a 5-anna crop. Incidence calculated on second crop only.
0 8	Do. ...	29 1/5	5 5/7	*Experiment No. 19.*—Wheat, *lálha*, on good *besar* land that formed a seed-bed for rice for which it was heavily dressed with 25 carts of ordinary manure, 7 to 8 maunds of *varkhada* leaves and about 5 maunds of castor cake per acre. Rotation :—rice followed by wheat always. Season as above. Crop slightly suffered from mildew from late February showers. Outturn better than above and ranges between 9 and 10 annas according to formulæ. Incidence on second crop.
0 10	Do. ...	42 1/4	...	*Experiment No. 20.*—Gram grown as a second crop after rice on unmanured and unirrigated *gorádu* land. Rotation :—rice during the first three years and sesame in the last two. Ample moisture from heavy late rains which spoiled the rain crop tempted the sowing of a second crop for the first time on this field. Yield more than bumper. Incidence on the second crop alone.
0 8	Do. ...	42 3/8	...	*Experiment No. 21.*—Same crop on another portion of the field referred to in test No. 17. Seed sown very late owing to excess of moisture in the soil at the usual time. Crop damaged by caterpillars and outturn scarcely 8 annas. High incidence accounted for by late sowing and damage by insects.
0 8	Do. ...	42 3/8	..	*Experiment No. 22.*—Same pulse on dry crop *gorádu* soil manured with 17 cart-loads of ordinary manure per acre. Land prepared for kharif crop but remained unsown owing to excessive rain. Rotation :—*bájri* and *kodra* with mixtures. Season, &c., as above. Yield more than bumper.
0 10	Do. ...	47 1/2	...	*Experiment No. 23.*—*Kodra* with subordinate mixtures on dry crop *gorádu* soil manured with 8 cart-loads of ordinary manure per acre. Rotation undefined :—*Bájri* and *kodra* with subordinate mixtures irregularly following each other. Season favourable for *kodra* but not for *tur* which appeared unhealthy and the other minor crops did worse. Crop 11 annas according to formulæ. Incidence high ; but subordinate crops not taken into account.
0 10	Do. ...	47 1/2	...	*Experiment No. 24.*—Same crop on similar soil, but more heavily manured with 18 cart-loads of ordinary manure per acre. Rotation :—*bájri, kodra* and *hávto* with subordinate mixtures taken irregularly. Season, &c., as above. *Tur* seemed better here than in above field. Value of subordinate crops omitted ; hence incidence high.

O. S.=Original Survey;

No.	District, Táluka, Village, and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds,	Incidence of Assessment on the Value of gross Produce,
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	KAIRA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Bamanji Edalji Modi, District Deputy Collector—continued.									
25	Mehmadabad (Khátraj).	Eleusine coracana (Bávto), 30th October 1892.	16	1,350	4	593	944	14 0 9	4 5 0 O. S.	30·70
	PANCH MAHA'LS.									
	Mr. E. Maconochie, Assistant Collector.									
26	Godhra (Godhra) ...	Rice (Gámadia), 14th October 1892.	14	1,115	14	1,231 with husk.	1,490	22 7 2	1 9 3 O. S.	3·60
27	Do. do. ...	Gram (Chani (small), 8th March 1893.	16	825	13½	820	645	21 4 0	Do. ...	
28	Do. (Bhámaiya) ...	Rice (Halki Bareja), 18th October 1892.	16	1,275	89½	1,589 with husk.	2,100	38 9 6	0 13 1 O. S.	2·11
	Mr. Pránlál Harkisandás, District Deputy Collector.									
29	Dohad (Jála) ...	Do. (Sutarsál), 2nd November 1892.	8	450	16½	738 with husk.	1,198	18 4 0	2 7 0 R. S.	9·09
30	Do. do. ...	Wheat (Vájia), 29th March 1893.	6	506	16½	226	513	8 8 11	Do. ...	
31	Do. (Wanbhori) ...	Rice (Sutarsál), 3rd November 1892.	6	340	10½	533 with husk.	480	11 14 3	1 11 10 R. S.	10·76
32	Do. do. ...	Gram and Barley, 29th March 1893.	4 8	185 190	7½ 16⅔	172 78	144 61	3 2 5 1 1 10	Do. ...	
								4 4 3		

Northern Division, 1892-93—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal product.	Prices of Produce per Rupee. By-Product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 10	40 weight.	43⅔	16⅙	*Experiment No. 25.*—*Bávto* taken as a sole crop on *gorádu* soil manured with 10 cart-loads of ordinary manure per acre and growing *bájri* with mixtures during the previous four years. Season unfavourable and crop suffered in growth from excessive moisture. Incidence high due to poor outturn—only 7 annas according to formulæ.
0 4	Do. ...	59½	7⅐	*Experiment No. 26.*—Inferior rice, *gámadia*, on *gorádu* soil with rock underneath a thin layer of earth, manured per acre with 30 cart-loads of ordinary manure in the previous year and this year dressed with 50 carts of silt from an adjacent tank. The field grows rice always followed by gram only when season allows. First sown seed dried up for want of moisture and necessitated a second sowing. Season afterwards very favourable. Seed rate high. Area of seed-bed not ascertained. Tillage described as indifferent yet the outturn full average according to the formulæ.
0 4	Do. ...	41	4⅐	*Experiment No. 27.*—Unmanured and unirrigated gram taken as a second crop on the above field. Ample moisture from late rains induced the cultivator to sow a second crop. Cultivation good and season favourable. Outturn full average. Seed rate compared to the formulæ (50 lbs.) very high.
0 4	Do. ...	43	7⅐	*Experiment No. 28.*—Rice, *halki bareja*, on *bhuri gorádu* soil manured with 15 cart-loads of ordinary manure per acre. Cultivation good. Season, &c., as above. Yield represents a 19-anna crop according to formulæ. A second crop intended to be grown, the season being favourable.
0 10	Do. ...	51¾	2⅝	*Experiment No. 29.*—Rice, *sutarsál*, sown broadcast on light brown *gorádu* soil manured with 10 loads of cowdung per acre and growing rice followed by wheat during the past three years. Tillage good, but season unfavourable, the crop having been damaged by late excessive rain. Seed rate very high—more than three times the formulæ. Yield under-estimated at 8 annas, being quite 13 annas according to the formulæ.
0 10	Do. ...	35⅐	2⅐	*Experiment No. 30.*—Unmanured and unirrigated wheat on the same field. Excessive moisture in the soil brought on rust and reduced the outturn which represents only a 2-anna crop according to the formulæ. Seed rate very high.
0 5	Do. ...	51¾	2⅝	*Experiment No. 31.*—Rice, *sutarsál*, unmanured and unirrigated, on similar but slightly inferior land growing rice followed by barley or gram or both every year. Season and tillage as above. Outturn 9 annas according to the formulæ. Seed double the average.
0 5	Do. ...	54⅔ 69¾	2⅐ 2⅐	*Experiment No. 32.*—Gram and barley in rows, one of the latter to three of the former on the above field. Season, &c., as above. Outturn not more than three times the seed reported to have been sown.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	PANCH MAHÁLS—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p	Per cent.
	Mr. Pránlál Harkisndás, District Deputy Collector—continued.									
33	Dohad (Simalia) ...	Rice (Kamod), 10th November 1892.	16	900	27	1,718 with husk.	1,575	47 2 0	2 13 2 R.S.	5·99
34	Do. do. ...	Do. do. 10th November 1892.	14	785	22½	1,395 with husk.	1,198	38 0 0	2 14 8 R.S.	7·67
	BROACH.									
	Mr. S. L. Batchelor, Assistant Collector.									
35	Broach (Upráli) ...	Chickling Vetch (Láng), 24th January 1893.	16	675	41	995	1,405	30 14 7	3 15 2 O.S.	12·77
36	Ámod (Buwa) ...	Great millet (Juvár), 12th February 1893.	16	1,050	12	886	1,184	33 7 8	3 12 5 O.S.	11·27
37	Do. do. ...	Wheat (Vásia), 12th February 1893.	14	850	41	523	705	24 3 1	4 10 8 O.S.	19·28
	Mr. Phirozsháh Pestonji, District Deputy Collector.									
38	Vágra (Páháj) ...	Cotton (Deshi Broach), 24th February to 25th March 1893. 4 pickings.	14	310	6	438 seed cotton.	...	46 0 10	4 9 7 O.S.	9·92
39	Do. do. ...	Chickling Vetch (Láng), 24th February 1893.	14	460	54	803	1,730	29 10 11	4 3 0 O.S.	14·10
40	Do. do. ...	Wheat (Potia), 7th March 1893.	14	790	60	762	1,170	32 9 0	Do.	12·85
41	Do. do. ...	Great millet (Juvár), 7th March 1893.	14	850	10	585	810 kadbi, 90 chaff.	19 3 11	Do.	21·75

Northern Division, 1892-93—continued.

R. S.=Revision Survey.

Area of Test.	Equivanlent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13.	14	15	16
A. G.	Tolas.	Lbs.	Cwt.	
0 8	40 weight.	41	$2\frac{5}{7}$	*Experiment No. 33.*—Rice, *kamod*, on similar but more highly assessed land growing rice followed by wheat without manure or irrigation every year. Season favourable for this crop and tillage very good. Outturn $1\frac{1}{2}$ times that recorded for a bumper crop in the formulæ. Area of seed-bed for an acre of plantation given at $1\frac{3}{4}$ gunthas. The seed-bed rather small.
0 5	Do. ...	41	$2\frac{5}{7}$	*Experiment No. 34.*—Do. do. do. Outturn nearly double the formulæ standard.
0 8	Do. ...	$49\frac{1}{4}$	$1\frac{1}{7}$	*Experiment No. 35.*—Chickling vetch grown continuously on good deep black soil without manure. Land unsuitable for cotton or any other crop owing to its low-lying position. Rain seasonable and sufficient; bright weather afterwards; clouds injure *láng*. Cultivation good. Outturn under-estimated being more than bumper (900 lbs.) according to formulæ.
0 10	Do. ...	$32\frac{3}{4}$	$1\frac{4}{7}$	*Experiment No. 36.*—*Juvár* on black soil mixed with a good deal of *kankar* growing cotton and *juvár* in rotation. Field manured with 10 cart-loads of cattledung per acre before sowing. Season as above. Tillage careful. Crop, compared to the formulæ, 13 annas only.
0 8	Do. ...	$26\frac{1}{4}$	$1\frac{5}{7}$	*Experiment No. 37.*—Similar soil manured with 8 loads of cowdung per acre and growing either *juvár* or wheat in rotation with cotton. Season as above, but tillage indifferent. Outturn not more than 9 annas according to formulæ. Incidence high; but apparently the burden of assessment must lie on cotton the principal crop and not on one taken in lieu of a bare fallow.
0 24	Do. ...	$9\frac{1}{2}$	...	*Experiment No. 38.*—Cotton, *deshi*, on fairly good black unmanured soil. Rotation undefined:—(1) *láng* and *juvár*, (2) cotton and *juvár*, (3) cotton and *láng*. Season excellent. Tillage indifferent and crop somewhat uneven. All the four pickings tested. Yield 18 annas according to the formulæ standard.
0 8	Do. ...	$48\frac{2}{3}$	$1\frac{1}{7}$	*Experiment No. 39.*—Unmanured *láng* on gravelly and low lying land, *morkankariát*, growing mostly wheat, *láng* and *juvár* and also occasionally cotton and sesamum. Season good. Tillage indifferent. Seed rate rather high. Yield more than bumper (700 lbs.).
0 8	Do. ...	$26\frac{1}{4}$	$2\frac{5}{7}$	*Experiment No. 40.*—Wheat, *potia* with a mixture of *hánsia* and *kátha*, on another part of the same field. Season, &c., as above.
0 8	Do. ...	$35\frac{1}{2}$	$2\frac{5}{7}$ kadbi, $2\frac{5}{7}$ chaff.	*Experiment No. 41.*—*Juvár* on the same field. Season, &c., as above. Outturn estimated at 14 annas but does not represent more than 9 annas according to formulæ. Incidence high due to indifferent cultivation.

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	BROACH—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Phirozsháh Pestonji, District Deputy Collector—continued.									
42	Vágra (Páldi)	Wheat (Hánsia), 23rd March 1893.	16	900	41	841	1,010	35 1 8	3 15 4 O.S.	11·27
	SURAT.									
	Mr. J. W. A. Weir, Assistant Collector.									
43	Jalálpor (Eru) ...	Castor-seed (Diveli), 28th March 1893.	11	350	14	415 seed.	...	20 5 0	3 8 8 O.S.	17·43
	Mr. E. H. E. Leggat, Assistant Collector.									
44	Bulsár (Ábráma) ...	Large fruited dolichos (Vál).	10	445	73½	1,046	2,950	32 8 10	13 9 8 O.S.	41·79
45	Do. (Párdi Párnera)	Castor-seed (Diveli), 19th March 1893.	12	340	29½	248 seed.	...	11 6 6	0 15 0 O.S.	8·21
46	Do. do. ...	Do. do. 21st March 1893.	10	280	31	180 seed.	...	8 4 11	1 1 1 O.S.	12·90
	Mr. Anna Gopál Kotvál, District Deputy Collector.									
47	Olpád (Barbodhan) ...	Rice (Májarvel), 19th November 1892.	16	1,350	112	2,267 with husk.	2,609	46 6 6	11 9 0 O.S.	24·91
48	Bárdóli (Ráyam) ...	Wheat (Hánsia), 26th February 1893.	8	490	76	624	427	25 6 8	4 3 0 O.S.	16·47
	THA'NA.									
	Mr. L. G. Deshmukh, Assistant Collector.									
49	Kalyán (Chole) ...	Gram (Harbhara), 15th March 1893.	20	500	13	485	600	16 4 0	4 13 0 O.S.	29·61

Northern Division, 1892-93—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. G.	Tolas.	Lbs.	Cwt.	
0 8	40 weight.	26¼	2⅞	*Experiment No. 42.*—Dry-crop wheat, *hánsia*, on medium black soil liberally dressed with 20 cart-loads of cattle droppings and farm-refuse per acre and growing cotton in alternate years with either *juvár* or wheat. Field prepared for cotton, but seedlings washed away by heavy rain in July-August. Soil too wet to allow resowing of cotton. Wheat therefore was taken. Rabi season favourable and tillage excellent.
0 8	37 do. ...	20½	...	*Experiment No. 43.*—Castor-seed on light brown *gorát* soil usually growing without manure cotton alternately with *juvár* alone or with subordinate pulses. Cotton seeds rotted this year in the low lying portion of the field owing to excessive rains and the oil-seed taken as a catch crop. Cultivation and season fair. Incidence necessarily high.
0 8	Do. ...	37	5	*Experiment No. 44.*—*Vál* grown as a second crop on highly assessed black rice land manured with 20 carts of cowdung per acre before sowing of the first crop of rice. Cultivation good but season reported to be indifferent. Seed rate high. Yield, however, more than bumper though reported at 10 annas only. Incidence of assessment on the second crop only.
0 8	Do. ...	22	...	*Experiment No. 45.*—Castors, a sole crop on ordinary black soil, grown without manure and irrigation. Season good. Tillage only fair. Yield, compared to the forumlæ, 8 annas only. Rotation not reported.
0 8	Do. ...	22	...	*Experiment No. 46.*—Do. do. do. Crop represents a 6-anna yield according to formulæ.
0 4	Do. ...	51⅔	6⅛	*Experiment No. 47.*—Inferior rice, *májarvel*, grown continuously on yellowish *gorát* soil manured liberally with 18 cart-loads of cowdung and 540 lbs. of castor cake per acre before sowing. Rain, though it commenced late, was continuous and favourable for the kind of soil experimented upon. Seed rate compared to the formulæ (30 lbs.) very high and the proportionate area of seed-bed (given at 3 gunthas for an acre) doubtful. Yield one and one-fourth times that given for a bumper crop in the formulæ. Probably a second crop followed the rice.
0 8	Do. ...	24⅔	5	*Experiment No. 48.*—Dry-crop wheat, *hánsia*, on black soil manured with 20 cart-loads of cowdung per acre and growing during the past three years cotton and *juvár* alternately. Sowing retarded owing to heavy late rains but season favourable later. Tillage good. Crop much below *táluka* average (14 annas).
0 4	70 ...	32⅛	4⅔	*Experiment No. 49.*—Gram grown as a second crop on unmanured and unirrigated soil. Rotation during the previous three years:— (1) and (2) rice and *vál*, (3) rice and watermelon. Cultivation good and season favourable at first but the crop under test, with other crops in the neighbourhood, injured by insects. Seed rate recorded by the experimenter in this and the following tests doubtful. Sample ser weighed 72 tolas in this office.

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	THÁNA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. L. G. Deshmukh, Assistant Collector —continued.									
50	Kalyán (Wádeghar) ...	Large fruited dolichos (Vál), 21st March 1893.	13	270	10	279	780	10 15 0	1 6 11 O. S.	10·18
		Safflower (Kardai), 3rd April 1893.	20	...	1	141 seed.	...	3 2 0		
								14 1 0		
51	Sháhápur (Bhátsái) ...	Large fruited dolichos (Vál), 28th March 1893.	20	400	13	636	800	23 12 0	3 14 9 O. S.	16·51
	Mr. V. R. Patvardhan, District Deputy Collector.									
52	Váda (Kansád) ...	Gram (Harbhara), 25th February 1893.	16	400	88½	886	...	30 0 0	2 0 6 O. S.	6·77
53	Do. (Mánde) ...	Do. do. 26th February 1893.	14	335	86	699	...	24 0 0	1 7 5 O. S.	6·09
54	Bhivandi (Dugád) ...	Large fruited dolichos (Vál Kadve), 27th March 1893.	16	480	30	455	752	15 8 0	3 13 9 O. S.	24·89

Northern Division, 1892-93—concluded.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce Per Rupee.		Remarks.
		Principal product.	By-Product.	
12	13	14	15	16
A. G.	Tolas.	Lbs.	Cwt.	
0 8	68	28	$7\frac{3}{7}$	*Experiment No. 50.*—*Vál* mixed with safflower on black clay soil growing the same mixed crop year after year. Tillage good. Season favourable for safflower but not for *vál* which was attacked by grubs owing to rainy weather in February. Proportionate area under the two crops as 3 : 1. No formulæ for safflower, it being rarely grown in this district.
	55	45	...	
0 8	68	28	$7\frac{4}{7}$	*Experiment No. 51.*—*Vál*, a second crop on black *chikanvat* soil, grown without manure or irrigation. Rotation :—rice continuous. Second crop grown this year only, the land having received ample moisture through the late October heavy rains. Cultivation good. Season as above. Rain in February however injuriously affected the crop causing worms. Sample gave an excess of $2\frac{1}{2}$ tolas in this office.
0 10	72	29	...	*Experiment No. 52.*—Gram grown, without manure or irrigation, as a second crop on ordinary level rice land, *madhyam káli*, on which rice followed by gram is grown every year. Cultivation good and season very favourable for rabi crops in general, the late October rains supplying ample moisture. Seed-rate nearly treble that in the formulæ (30 lbs.) and appears doubtful. Outturn more than double the average recorded in the formulæ. Incidence of assessment calculated on the second crop alone.
0 10	71	$29\frac{1}{3}$	...	*Experiment No. 53.*—Gram grown continuously on similar but rather uneven low land. The field being waterlogged in the rains, was unfit for rice. Season as above, but cultivation not so careful. Outturn below that in the above test, the decrease being attributed to partial decay of seed sown due to excess of moisture. Seed rate doubtful. Yield more than bumper and more than double the estimate for a 14-anna crop.
0 10	74	$30\frac{1}{3}$	$13\frac{1}{2}$	*Experiment No. 54.*—*Vál*, *kadva*, on middling, *chickan*, rice land growing continuous rice followed by *vál* whenever moisture sufficient to allow the raising of a second crop. Field manured with 4 cart-loads of ordinary manure before the sowing of the rice, the first crop. Season favourable but the crop tested as well as those in the neighbourhood suffered a little from caterpillars. Cultivation careful and field free from weeds. Incidence of assessment on the second crop alone.

Summary of Crop Experiment Reports,

O. S. = Original Survey

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	NA'SIK. *Mr. L. G. Deshmukh, Assistant Collector.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
55	Sinnar (Sinnar) ...	Spiked millet (Bájri), 4th November 1892.	16	640	5	910	2,112 straw, 240 chaff.	22 8 2	1 0 0 R. S.	4·44
56	Nándgaon (Velgaon)...	Cotton (Varádi), 22nd November 1892.	8	80	$6\frac{3}{5}$	310 seed cotton.	...	20 12 6	1 3 8 O. S.	5·91
57	Kalvan (Kalvan Bndruk).	Wheat (Lál Káthe), 13th February 1893.	15	595	$32\frac{3}{4}$	616	...	21 10 3	1 2 5 O. S.	5·31
	Mr. H. W. Hayward, Assistant Collector.									
58	Niphád (Niphád) ...	Do. (Pivla), 11th March 1893.	16	1,080	32	678	1,196	32 9 1	2 15 7 R. S.	9·13
	Mr. C. M. Thatte, District Deputy Collector.									
59	Násik (A'nandvalli) ...	Do. (Pivla Potya), 23rd March 1893.	8	160	$50\frac{1}{3}$	254	624	10 11 9	1 4 9 R. S.	12·08
60	Do. (Gangápur) ...	Onions, 24th March 1893.	14	6,200	12 sers.	12,923	...	131 4 0	2 7 11 R. S.	1·90
	AHMADNAGAR. *Mr. M. C. Gibb, Assistant Collector.*									
61	Nevása (Sonai) ...	Wheat (Dáudkháni), 24th February 1893.	16	800	78	795	310 straw, 10 bundles chaff.	27 11 9	1 1 7 R. S.	3·96

Central Division, 1892-93.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-Product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 10	112	46	$8\frac{4}{7}$ straw, $4\frac{2}{7}$ chaff.	*Experiment No. 55.*—Medium black soil manured with a light dressing of four cart-loads per acre ordinary manure and growing in alternate years *bájri* and groundnut. Cultivation good. Season somewhat unfavourable owing to heavy late rains; but the crop undertest, though stated to be average of the locality, gave more than bumper yield according to the formulæ. Seed rate low. Sample of grain received in this office weighed 107 tolas only.
0 8	80 weight.	15	...	*Experiment No. 56.*—Cotton, *varádi*, on unmanured ordinary black soil on which *bájri* rotates with cotton. Cultivation careful, but crop damaged by excessive late rain and only one picking could be gathered. Seed rate very low (half the formulæ rate); and outturn considerably under-estimated being full average according to the formulæ.
0 8	143	$29\frac{1}{3}$	...	*Experiment No. 57.*—Dry-crop wheat, *lál káthe*, on ordinary black soil manured two years ago with about 12 cart-loads ordinary manure per acre. Rotation :—(1) wheat, (2) sesamum, (3) wheat, (4) *bájri* or sesamum. Season favourable and tillage good. By-product not weighed and valued very low. Sample received in this office weighed $139\frac{1}{2}$ tolas only.
0 9	113	$23\frac{1}{6}$	$3\frac{1}{5}$	*Experiment No. 58.*—Irrigated wheat, *pivla*, on heavily manured black soil. Rotation undefined, but the cropping for the past three years was :—(1) sugarcane, (2) and (3) *bájri*. Field ploughed five times before sowing; cultivation careful. Irrigated wheat in the locality mostly affected with rust, but that under test quite free from it. Yield, compared to the formulæ, only 12 annas, which is also the táluka average this season.
0 20	109	$25\frac{1}{7}$	9	*Experiment No. 59.*—Unmanured and unirrigated wheat on inferior *murum* soil mixed with lime nodules growing *bájri* and wheat in alternate years. Tillage indifferent and season unfavourable, the crop having been affected with blight (? rust). Seed rate very high.
0 10	80 weight.	$98\frac{1}{2}$	...	*Experiment No. 60.*—Fairly good black soil on which groundnut and sugarcane had been taken during the previous two years. *Tág* (crotolaria juncia) ploughed in at end of August as green manure before plantation of seedlings which had previously been grown in a nursery. A month later a top dressing of 20 cart-loads of ashes per acre given probably as a precaution against insect attack. Outturn more than double the formulæ estimates which are probably incorrect.
0 8	$122\frac{1}{2}$	$31\frac{7}{13}$	$1\frac{1}{9}$ straw and 4 bundles chaff.	*Experiment No. 61.*—Dry-crop wheat, *dáudkháni*, on unmanured black soil growing in alternate years (1) *bájri* and (2) wheat mixed with safflower. *Kardai* stated to have been sown only to a small extent this year and being probably unripe at date of experiment was not tested. The seed rate shown in column 6 represents that of two sowings; the seed sown first or the seedlings were washed away by heavy September-October rains. Later the season was more favourable; cultivation good. Grain valued rather low. The experimenter reports the weight of a measure ser at $122\frac{1}{2}$ tolas, but bases his calculations upon $102\frac{1}{2}$ tolas per ser, while the sample received in this office weighed $100\frac{1}{2}$ tolas. Figures therefore doubtful.

Summary of Crop Experiment Reports,

O. S. = Original Survey.

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of Principal Product.	Yield of By-Product.	Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
1	2	3	4.	5	6	7	8	9	10	11
	AHMADNAGAR. —*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent
	Mr. M. C. Gibb, Assistant Collector. —continued.									
62	Párner (Pimpalgaon) .	Wheat (Bakshi), 23rd March 1893.	16	1,080	64	413	727 straw, 377 chaff.	22 8 0	2 8 0 R. S.	11·11
	Mr. Sorábji Padamji, Assistant Collector.									
63	Akola (Akola) ...	Wheat (Káthe) and	12	400	24	994	1,005	30 14 4	1 10 9 R. S.	5·20
		safflower (Kardai), 27th. ~~December~~ 1893.	...	...	...	72 seed.	...	1 4 0		
								32 2 4		
64	Do. do. ...	Gram (Harbhara), 27th February 1893.	8	120	19½	431	280	11 9 0	Do.	14·46
	Mr. V. B. Vádekar, District Deputy Collector.									
65	Shrígonda (Kolgaon) .	Great millet (Kálbondi Jowári),	9	300	4	197	770 kadbi, 30 chaff;	9 8 6	0 12 10 R. S.	6·87
		and safflower (Kardai), 19th February 1893.	11	25	⅘	61 seed.	100	2 2 0		
	Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture. C. D.							11 10 6		
66	Shrigonda (Visápur) ...	Great millet (Kálbondi Jowári) and	12	500	5	370	1,100 kadbi, 115 chaff;	13 1 8	0 7 1 R. S.	3·25
		safflower (Kardai), 14th February 1893.	12	65	1	18 seed.	...	0 9 3		
								13 10 11		
67	Do. do. ...	Gram (Harbhara), 15th February 1893.	12	300	55⅗	782	450	19 15 10	3 11 2 R. S.	18·49

Central Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-Product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 4	104	21⅓	3⅛	*Experiment No. 62.*—Wheat, *bakshi*, grown as a second crop on black garden land, manured with 50 cart-loads per acre before sowing the rain crop (*bájri*). Rotation :—(1) *bájri* and gram, (2) *bájri*, and (3) *bájri* and wheat. The crop irrigated from a channel fed by a stream; but the extent of irrigation not stated. Cultivation and season both good. The yield, compared with the formulæ, only a 10-anna one. The grain was shrivelled and weighed 58 lbs. per bushel. Incidence of assessment worked out on the second crop only.
0 16	114	35	3½	*Experiment No. 63.*—Wheat, *Káthe*, with a sprinkling of safflower on unirrigated and unmanured black soil growing in rotation :—(1) *bájri*, (2) wheat and safflower, and (3) *bájri* during the past three years. Cultivation good. The crop said to have suffered a little from excess of rain at end of October. The outturn, compared to the formulæ, is more than bumper and nearly 2½ times that for a 12-anna crop. Seed rate for *kardai* not reported, nor was a sample sent to this office as required by standing orders.
	107¾	58	...	
0 8	116	47⅔	1	*Experiment No. 64.*—Gram, a second crop after *bájri*, on another part of the same field. Rotation and season as above. Tillage indifferent. Outturn under-estimated at 8 annas, being nearly 15 annas compared to the formulæ. Incidence of assessment on the second crop alone.
0 4	110	45	1⅜ kadbi, 1⁵ chaff,	*Experiment No. 65.*—Unmanured and unirrigated rabi *jowári* mixed with *kardai* on poor black soil growing irregularly *jowári* and *bájri*. Cultivation good, but season unfavourable to both the crops owing to excess of moisture from late heavy rains. Area of test below minimum allowed by standing orders. Sample sers received in this office showed an excess of three tolas for both the grains.
	86	30⅞	5⅝	
0 8	107	41	2½ kadbi, 5⅝ chaff.	*Experiment No. 66.*—Same crop mixed in the proportion of 5 : 1 on a field having fairly deep black soil in part and shallow friable reddish brown elsewhere. The field is never manured, ploughed only every other year, and grows alternately :—(1) *jowári* and *kardai*, and (2) wheat and linseed; also occasionally *bájri* with subordinate pulses. Season fair for *jowári*, but *kardai* almost entirely spoiled by the heavy October rain. The field fairly free of weeds and tillage good. Outturn, compared to the formulæ, a 10-anna one.
	70	31	...	
0 8	113	40½	5⅝	*Experiment No. 67.*—Gram, a second crop after *bájri* on good deep black soil, manured with 40 cart-loads per acre of stable and household refuse in March before the sowing of the first crop. Rotation undefined, but *jowári* with *kardai* taken dur ng the past two years. Rain at end of October very beneficial to rabi crops in general, though it partially damaged the first crop of *bájri*. The portion of the field under gram irrigated once a fortnight till end of January from a channel fed by a stream from which water available till end of March. Cultivation good; field free of weeds. Yield probably under-estimated. Incidence high due to low prices and being calculated on the second crop only.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	AHMADNAGAR. —*continued.* *Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.*—contd.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p	Per cent.
68	Ráhuri (Ráhuri) ...	Wheat (Sude Pivla),	16	705	40	620	900	28 11 1	1 10 1 R. S.	4·76
		and Safflower (Kardai), 10th March 1893.	16	15	⅔ seed.	...		5 8 7		
								34 3 8		
	POONA. *Mr. C. P. B. Wiltshire, Assistant Collector.*									
69	Mával (Náne) ...	Wheat (Potia), 24th February 1893.	20	800	48	361	410 straw, 455 chaff.	12 10 2	1 1 6 R. S.	8·65
70	Khed (Chákan) ...	Onions, 13th March 1893.	16	8,000	9⅐ sers.	15,580	4,770	72 2 1	2 6 8 R. S.	3·35
71	Junnar (Náráyangaon). *Mr. H. W. J. Bagnell, Assistant Collector.*	Potatoes, 16th March 1893.	11	6,800	1,033	9,2 3	...	15 7	8 9 10 R. S.	11·96
72	Bhimthadi (Bárámati).	Groundnut (Bhuimug), 16th February 1893.	16	3,200	28 sers.	1,283 in shell	1,193	48 12 0	0 6 5 R. S.	0·08
73	Do. do. ...	Do. do ...	14	2,500	20 sers.	1,5[illegible] in shell	3,198	48 9 6	0 15 3 R. S.	1·96

Central Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-Product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	110	24	$2\frac{5}{7}$	*Experiment No. 68.*—Wheat, *sude*, with a sprinkling of safflower on dry-crop deep black soil manured once in 10 years with about 25 cart-loads of ordinary manure per acre. The last manure given six years ago. Rotation undefined, but the same crop grown during the past two years with the addition of gram last year. The field is ploughed once in three years; cultivation careful and land free of weeds. The wheat sample received weighed only 106 tolas and contained a considerable proportion of bellied (potia) grain.
	85	$30\frac{1}{2}$	...	
0 8	$100\frac{5}{8}$	$30\frac{7}{8}$	$11\frac{5}{7}$ straw, $6\frac{1}{2}$ chaff.	*Experiment No. 69.*—Unmanured and unirrigated wheat, *potia*, on ordinary blackish soil growing similar crops during the last three years. Season favourable at first but cloudy weather and dew, a fortnight previous to harvest induced rust. Cultivation indifferent. Crop reported at 20 annas, but yield less than 12 annas compared to the formulæ. Sample two tolas short of the recorded weight.
0 4	79 weight.	216	..	*Experiment No. 70.*—Onions on a black brown *bágáyat* land grown as a second crop after *bájri*. About 22 cart-loads of cowdung per acre of manure applied as a top-dressing; and the crop irrigated from a well, the extent of irrigation is not noted. Area of seed-bed to an acre of field reported at $1\frac{1}{2}$ gunthas. Season favourable for onions and crop nearly double the formulæ yield. Produce was, however, weighed quite wet and valued rather low.
0 4	78 do.	128	...	*Experiment No. 71.*—Potatoes taken as a second crop after *bájri* on blackish soil heavily manured before sowing with 39 cart-loads per acre of cowdung and sheep droppings. Crop irrigated from a channel; water supply was ample owing to late heavy rains. Rotation:—(1) sugarcane, (2) chillies and (3) *bájri* and potatoes. Crop estimated at 11 annas, but is nearly 13 annas according to formulæ. Value rather low. Incidence of assessment on second crop alone.
0 8	$32\frac{5}{8}$	$26\frac{2}{3}$	17	*Experiment No. 72.*—Groundnut on low lying and by far the best portion of a field having light friable soil growing alternately *bhuimug* and *bájri* or *jowári*. Land not manured but receives the soil washed from the higher lying portion of the field. Crop watered five times from the Nira Canal at a charge of Rs. 4 per acre. Season fair, though the flood water from heavy rains in October damaged the crop. Cultivation poor. Yield, though estimated at 16 annas, represents only a 9-anna crop according to formulæ. By-product useful as fodder much under-valued at 17 cwt. per rupee. Sample weighed in this office $35\frac{1}{2}$ tolas per ser. Figures in this as well as the following test corrected in this office, the experimenter having based all his calculations on 42 tolas per pound.
0 8	$39\frac{5}{7}$	$32\frac{1}{2}$	$20\frac{1}{4}$	*Experiment No. 73.*—Same crop on *chopan* light quick drying soil, non-retentive of moisture, grown alternately with *jowári*. Crop watered from the Nira Canal seven times. As above the crop suffered from excess of moisture from late rains and was slightly injured by rats. Outturn better than in the last test and should be classed according to the formulæ at 12 annas. Seed rate in this as well as the test above given in sers and not in pounds. Sample in this office showed $34\frac{3}{5}$ tolas for a ser.

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	POONA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. C. N. Seddon, Assistant Collector.									
74	Indápur (Indápur) ...	Great millet (Dagdi Jowári), 26th January 1893.	13	830	40	1,143	8,550 kadbi, 205 chaff.	38 3 10	0 13 0 R. S.	2·12
	Mr. J. W. Mollison, Superintendent of Farms.									
75	Khed (Khed)	Wheat (Kálikusal), 14th February 1893.	16	1,080	46½	1,052	1,630	44 13 6	3 7 2 R. S.	7·68
76	Do. (Ráksheváḍi) ...	Potatoes, 20th February 1893.	14	11,360	1,120	8,490	...	151 9 9	2 10 8 R. S.	1·75
77	Do. do. ...	Do. 21st February 1893.	16	14,400	1,400 about.	10,230	...	200 15 0	1 7 6 R. S.	0·73
	SHOLA'PUR.									
	Mr. R. C. Brown, Assistant Collector.									
78	Karmála (Rople) ...	Great millet (Dagdi Jowári)	16	1,120	3⅔	340	245 bundles kadbi, 20 sers bran.	10 9 4	0 12 0 R. S.	6·66
		and Safflower (Kardai), 23rd February 1893.	...	...	1⅛	8½ sers seed.		0 10 10		
								11 4 2		
79	Do. do. ...	Wheat spelt (Khapli or Jod), 24th February 1893.	20	1,800	1·02	1,600 husked	3,400 bundles.	53 14 8	1 8 2 R. S.	2·80
80	Do. (Karmála) ...	Great millet (Jowári)	16	1,120	4⅔	430	380 bundles kadbi, 20 sers bran.	14 0 8	0 12 9 R. S.	5·28
		and Safflower (Kardai), 4th March 1893.	...	...	½ ser.	12½ sers seed.		1 0 8		
								15 1 4		

Central Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per rupee.		Remarks.
		Principal Product.	By-Product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 4	98	40$\frac{1}{5}$	5$\frac{1}{11}$ kadbi, 1$\frac{1}{2}$ chaff.	*Experiment No. 74.*—Rabi *jowári* on first class black soil, manured with 5 cart-loads of night-soil and household refuse per acre, and irrigated by means of an old well in the field. *Jowári* and *khapli* wheat taken in rotation. Rain said to have been too heavy and damaged the crop to some extent. Cultivation careful, but the grain eaten a little here and there by birds. Outturn compared to the formulæ more than 16 annas. By-product weighed when wet. Sample of grain forwarded to this office weighed 85 tolas only; figures, therefore, doubtful.
0 4	104$\frac{1}{2}$	24	11$\frac{2}{3}$	*Experiment No. 75.*—Irrigated wheat, *kálikusal*, on medium black, *murmád káli*, soil growing in alternate years *bájri* followed by wheat or gram and groundnut. Land usually manured for groundnut only. The crop copiously irrigated twice in December from a *pát*. Moisture from late rains ample and no further watering necessary. Season generally favourable for rabi crops, though wheat suffered to a slight extent from rust owing to cloudy weather. Cultivation good. Incidence of assessment on the second crop only. By-product valued very low.
0 4	78 weight	56	...	*Experiment No. 76.*—Potatoes, a second crop after *bájri* on a *kálvat*, black loamy soil growing the same double crops in each of the last three years. Land manured with 14$\frac{1}{4}$ carts farm yard manure per acre at end of October before sowing, and the crop received ten waterings from a well in the field. Season and tillage both good. Crop 12 annas according to the formulæ. Produce rather small in size and showed symptoms of disease; hence price low.
0 4	78 weight.	51	...	*Experiment No. 77.*—Same crop following kharif potatoes on similar, but deeper soil manured for the second crop with 13 cart-loads of farm yard manure per acre. Rotation undefined. The crops for the past three years were:—(1) *bájri* with *kulith* and potatoes, (2) *bájri* and (3) two crops of potatoes. Season and tillage as above. Crop watered nine times. Produce 13 annas according to formulæ. Seed rate doubtful.
0 8	127$\frac{3}{4}$ ...	42$\frac{1}{2}$ 12 sers	100 bundles kadbi, 128 sers bran.	*Experiment No. 78.*—Rabi *jowári* with safflower on unirrigated and unmanured high level shallow land, partly *barad* and partly *morvad* (blackish), lying fallow for the last four years. The crop under test had besides a sprinkling of wheat and linseed, which was not tested by the experimenter. Tillage good, but the crop suffered from excessive rain which reduced the yield. Sample ser of *jowári* received in this office weighed 132 tolas, though the experimenter bases his calculations upon 127$\frac{3}{4}$ tolas, a ser. Weight of *kardai* ser not ascertained.
0 4	132$\frac{3}{4}$	30$\frac{2}{3}$	2,000 bundles.	*Experiment No. 79.*—Wheat, *khapli* or *jod*, on brown muddy, *pándhari*, land irrigated by means of a double *mot* working on a well. Rotation:—maize followed by wheat for the past three years. Tillage good and season favourable. The field close to and receives sullage from the neighbouring village. The crop received eight waterings at an interval of 12 to 14 days between each. Seed rate high. The experimenter takes a ser equal to 132$\frac{3}{4}$ tolas, but the sample sent to this office gave 138$\frac{1}{2}$ tolas.
0 8	138 ...	46 12 sers	83$\frac{1}{3}$ bundles kadbi, 128 sers bran.	*Experiment No. 80.*—*Jowári* with *kardai* on mixed *bharad*, black and *chopan* soil, grown without manure or irrigation. Rotation:—Safflower alone for two years and then *jowári* with safflower for next two years. Tillage good, but season only fair, the heavy late rain having apparently injured the crop to some extent. Probably the *chopan* (sticky) character of the soil was accountable for it. Compared to the formulæ the crop represents a 10-anna crop only. Sample weighed 134 tolas in this office.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce
						Principal Product	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	SHOLA'PUR—*contd.* *Mr. B. R. Heblikar, District Deputy Collector.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
81	Pandharpur (Shegaon).	Great millet (Jowári Gudadi), 4th March 1893.	10	435	6	276	833	10 6 8	1 1 11 O. S.	10·75
82	Do. (Bhálawni).	Wheat (Khapli), 8th March 1893.	14	1,210	76	1,567 with husk.	2,297	43 4 6	1 4 7 O. S.	2·97
	SA'TA'RA. *Mr. T. D. Fry, Assistant Collector.*									
83	Jávli (Bibhvi) ...	Great millet (Shálu Jowári) and safflower (Kardai), 21st February 1893.	5 8	112 25	9¼ ...	196 29 seed.	534 43	8 11 8 0 12 6 9 8 2	1 2 5 O. S.	12·10
84	Koregaon (Koregaon).	Gram (Harbhara), 8th March 1893.	12	350	51¾	468	439 chaff.	12 9 11	2 6 3 R. S.	18·94
85	Do. (Eksál) ... *Mr. V. R. Kelkar, District Deputy Collector.*	Spelt wheat (Khapli), 9th March 1893.	16	1,440	68	1,337 unclean, 978 cleaned.	2,561	46 4 0	4 3 4 R. S.	9·10
86	Mán (Bidál)	Groundnut (Bhuimug), 9th February 1893.	16	3,200	44	1,877 with shell.	4,082	70 15 10	5 0 0 R. S.	7·04
87	Wálwa (Támbve) ...	Gram (Harbhara), 28th February 1893.	14	470	65	469	495	14 4 6	2 10 8 O. S.	18·68
88	Karád (Mundhe) ...	Spelt wheat (Khapli or Jod), 21st March 1893.	13	1,090	139	1,203 with husk, 933 cleaned.	1,968	45 13 0	4 9 10 O. S.	10·07

Central Division, 1892-93—concluded.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-Product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
1 0	140	43	$1\frac{6}{7}$	*Experiment No 81.*—Rabi *jowári* on a lightly manured black soil growing in alternate years gram and *jowári* without irrigation. Tillage good, but owing to late heavy rains the crop ran to stalk and leaf reducing the yield of grain considerably. Sample received in this office was found to weigh 2 tolas in excess of the recorded weight.
0 16	$95\frac{1}{2}$	$39\frac{1}{6}$	$6\frac{1}{4}$	*Experiment No. 82.*—Wheat, *khapli*, on a white, *pándhari*, soil under well irrigation. Thirteen cart-loads of cowdung per acre were applied as a top-dressing soon after sowing. The crop had to be sown twice, the first sowing having been washed away owing to heavy rain soon after. The seed drilled a second time rather unseasonably. The crop throve well and gave, compared to the formulæ, a 17-anna outturn. The experimenter wrongly forwarded to this office a sample of cleaned grain, while the reported outturn figures show weights of grain in husk.
1 27	113 91	$31\frac{1}{8}$ $37\frac{1}{3}$	$1\frac{6}{7}$ ...	*Experiment No. 83.*—Rabi *jowári, shálu,* and *kardai* in rows (7 to 1) on poor black soil mixed with lime, *chunkhadi*, lightly dressed with 1 cart-load of cowdung per acre and growing the same mixed crop in each of the past three years. Cultivation careful, but season unfavourable, excessive rain just after sowing in September having damaged the crop and induced a disease *chikta*. Besides large trees damaged borders by shade. Rate of *kardai* seed ascertained, but being unreliable, not reported. Yield of *jowári* estimated at 5 annas, but compared to the formulæ, represents an 8-anna crop. Sample of *jowári* received in this office, weighed 4 tolas less than the weight recorded by the experimenter.
0 8	114	36	$12\frac{4}{7}$	*Experiment No. 84.*—Gram, a second crop after *bájri*, on medium black soil with lime nodules growing in alternate years *jowári* alone and *bájri* followed by gram. Land manured only for the first crop with $3\frac{1}{2}$ cart-loads of cowdung and ashes, and folding 250 sheep per acre for four nights. Tillage careful, but crop sown very late (end of November). Sowing delayed by continued late rains and crop suffered from excess of moisture. Seed rate more than double that noted in the formulæ. Yield 14 annas according to the same standard. Incidence of assessment on the second crop alone.
0 4	109	$22\frac{1}{3}$ clean grain.	$9\frac{1}{7}$	*Experiment No. 85.*—Wheat, *khapli* or spelt, grown as a second crop after *bájri* on a medium black soil. Rotation:—(1) groundnut, (2) *bájri* and brinjals, and (3) *bájri* and spelt wheat. Land dressed for first crop with 6 cart-loads of ordinary manure and irrigated from a single *mot* well in the field. Season favourable and tillage good. Incidence on the second crop alone.
0 4	80 weight.	$28\frac{2}{3}$	$6\frac{1}{2}$	*Experiment No. 86.*—Groundnut on *murum* soil having a large mixture of lime nodules manured with cowdung and ashes, 10 cart-loads to an acre, and irrigated by a private channel from the river Mán once in a fortnight. Rotation:—(1) *bhuimung*, (2) late *jowári* and barley, and (3) *rála* and wheat. Season on the whole good, but the crop suffered a little from excessive rain at end of October. Tillage good. Seed rate, compared with the formulæ, low and outturn only a 12-anna one according to it. By-product weighed when quite wet and valued rather low.
0 8	119	$33\frac{1}{2}$	$14\frac{1}{7}$	*Experiment No. 87.*—Gram, sole crop on a blackish, *kálvat*, soil, grown without manure or irrigation. *Shálu jowári* and gram or wheat with safflower are grown in alternate years, and the *shálu* crop always gets a light dressing of $2\frac{1}{2}$ cart-loads of cowdung per acre. Crop had to be sown a second time in November, the first sown seed having rotted by excessive rain at end of October. Season not unfavourable afterwards and cultivation good.
0 5	115	$23\frac{2}{3}$ clean grain.	$2\frac{6}{7}$	*Experiment No. 88.*—*Khapli* or spelt wheat, a second crop on a *khárvat* or saltish land recently improved by drainage, &c., into middling *kálvat* soil manured with folding a 1,000 sheep for three days a week before sowing. Crop irrigated five times from a well in the field. Land at first heavily manured for sugar-cane, but owing to failure of well water it failed and rice, the first crop, sown instead. Rotation:—(1) fodder *jowári*, (2) *rála* and (3) fodder *jowári*. Tillage good and outturn fair, crop being slightly damaged by rats. By-product, mainly useful for thatching purposes, valued rather high. Seed rate, compared to the formulæ (45 lbs.), very high.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	BELGAUM.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. R. E. Enthoven, Assistant Collector.									
89	Sampgaon (Kittur) ...	Rice (Mugad Bhatta), 12th November 1892.	16	1,200	58½	2,166 with husk.	20 bundles.	65 8 4	4 12 11 R. S.	7·33
90	Parasgad (Yergatti) ...	Italian millet (Navani),	16	560	3	263	10 bundles.	4 2 0	0 14 5 R. S.	21·10
		and Sorghum vulgare (Jowári), 28th November 1892.	...	...	¼ ser.	...	40	0 2 6		
								4 4 6		
91	Do. (Shindogi) ...	Italian millet (Navani),	11	245	3½	252	500	4 7 0	0 6 10 R. S.	8·70
		horse gram (Hurli),	...	...	1½ sers.	...	71	0 5 0		
		and Sorghum vulgare (Jowári), 6th December 1892.	...	...	⅛ ser.	...	60	0 2 6		
	Mr. C. C. Boyd, Assistant Collector.							4 14 6		
92	Belgaum (Kudchi) ...	Wheat, 11th February 1893.	12	400	51¼	329	407 straw, 205 chaff.	13 13 0	1 5 3 R. S.	9·58
	Mr. N. G. Deshpánde, District Deputy Collector.									
93	Chikodi (Kabbur) ...	Safflower seed (Kusubi), 4th February 1893.	20	1,000	4¼	794 seed.	...	14 9 6	0 15 3 R. S.	6·53
	BIJÁPUR.									
	Mr. J. M. Cursetji, District Deputy Collector.									
94	Indi (Loni Khurd) ...	Wheat (Khair Godhi), 11th February 1893.	10	310	44¼	262	442	11 13 1	0 10 2 R. S.	5·37

Southern Division, 1892-93.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-Product.	Remarks.
12	13	14	15	16
A. g	Tolas.	Lbs.	Cwts.	
0 4	57	35	$5\frac{1}{3}$ bundles.	*Experiment No. 89.*—Continuous rice, *mugad bhatta*, drilled on dark red *masári* land, manured with 8 cart-loads of cowdung per acre before sowing and irrigated from the village tank. Cultivation careful, water-supply good and the field clean. Rain, though commenced a little late was heavy throughout, and the crop would have been better still, but for the injuriously excessive fall in October. Seed rate nearly half that of the formulæ (100 lbs.) The outturn, compared with the formulæ, very high. By-product valued, but not weighed for want of a weighing apparatus.
0 8	$73\frac{1}{4}$	$75\frac{1}{8}$	16 bundles.	*Experiment No. 90.*—Italian millet, *navani*, mixed with *jowári*, on unmanured fair black soil, *yeri shime*, growing wheat for the last five or six years. Season unfavourable; rainfall too heavy; *jowári* produced no grain and but little fodder, and *navani* gave only an 11-anna crop according to the formulæ. Cultivation indifferent. The crop was weedy. It was raised on a small portion of a field growing also wheat and cotton, which would perhaps make good the unsatisfactory *navani* outturn.
	...	...	$2\frac{2}{7}$	
0 8	$70\frac{1}{4}$	72	$4\frac{5}{7}$	*Experiment No. 91.*—The same crop with rows of horse gram and *jowári* on inferior stony red soil, *hulkeri*, manured with 10 cart-loads of farm yard manure per acre and sheep folding for a fortnight in June. Rotation:—(1) Italian millet with mixtures, (2) *jowári*, and (3) cotton. Season as above, *jowári* and *kulthi* yielding nothing but fodder. Cultivation bad.
	...	...	2	
	...	...	$3\frac{3}{7}$	
0 8	$80\frac{1}{4}$	$25\frac{3}{4}$	$4\frac{1}{7}$ straw, $11\frac{5}{7}$ chaff.	*Experiment No. 92.*—Dry-crop wheat on medium black soil, *yeri bhumi*, manured with 5 cart-loads of cattle-dung every year per acre and growing *jowári* for two successive years followed by wheat, brinjals, or *rági* in the third. Season very good at first, but the crop, as elsewhere, attacked early in January with rust, attributed to dry south winds. Cultivation careful.
1 0	$66\frac{1}{4}$	$54\frac{1}{2}$	...	*Experiment No. 93.*—Safflower unmixed on unmanured black soil growing *jowári* or *bájri* alternately with *kusubi* in ordinary years, and also other miscellaneous crops when rainfall favourable for such. Season exceptionally favourable for safflower. The late heavy rains benefited it considerably. Cultivation careful. Crop weeded at an early stage, but *hariáli* appeared later. Seed rate very low. Compared to the formulæ, the outturn is a 16-anna yield. Sample of measure ser not forwarded to this office as required by standing orders.
0 $10\frac{5}{32}$	144	$22\frac{1}{8}$	...	*Experiment No. 94.*—*Khair godhi* or red wheat grown as a dry-crop on unmanured mixed black soil locally called *karl*. Rotation not clear; *jowári*, *bájri*, wheat, linseed and paddy being stated to have been grown every year in different parts of the field. Tillage fair, but the late heavy rains and a plague of rats in January, had an injurious effect on the growth of the crop. The by-product not valued, though stated to fetch a small value as fodder. Sample weighed in this office 141 tolas.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Taluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	BIJÁPUR—*continued.*									
	Mr. R. C. Ártal, District Deputy Collector.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent
95	Bágevádi (Bágevádi) ...	Red wheat (Kempu Godhi), 16th February 1893.	10	370	29⅔	379	547	13 3 8	0 13 11 R. S.	6·57
96	Do. do. ...	Do. 18th do. ...	9	304	29⅔	238	365	8 5 9	1 0 3 R. S.	12·14
97	Do. do. ...	Do. do. ...	7	195	29⅔	202	360	7 1 8	0 15 9 R. S.	13·85
	DHÁRWÁR.									
	Mr. A. R. Bonus, Assistant Collector.									
98	Hubli (Chhabbi) ...	Rice (Somsáli), 5th December 1892.	11	525	60¾	721 with husk.	590 straw, 240 chaff.	21 9 9	5 10 1 R. S.	26·05
	Mr. J. McNeill, Assistant Collector.									
99	Ránebennur (Medleri) ...	Italian millet (Navani), 28th November 1892.	8	140	9½	226	1,625	3 14 1	0 7 3 R. S.	11·68
100	Kod (Hádrihalli) ...	Sugarcane (Rasdáli), 21st February 1893.	9	1,620	9,000 sets.	4,697 gul.	11,260 green tops, 5,840 leaves.	320 2 3	2 5 0 R. S.	0·72
101	Do. do. ...	Do. 22nd do. ...	4	420	3,000 sets.	1,836 gul.	6,440 green tops, 3,820 dry leaves.	127 15 11	Do.	1·80

Southern Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Price of Produce per Rupee. Principal Product.	Price of Produce per Rupee. By-Product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	144¾	29⅔	10⅙	*Experiment No. 95.*—Dry-crop hard red wheat, *kemp godhi*, on light black soil locally called *carlu*, which did not get any manure for the last seven or eight years. Rotation undefined; the cropping during the past three years was :—(1) wheat, safflower and *jowári*, (2) gram, safflower and *jowári*, and (3) cotton, gram and *jowári*. Every eighth row of wheat was sown mixed with safflower. The oil-seed was not tested. Cultivation good, but season unfavourable, rain at end of October being excessive and untimely, the crop had to be sown late, which reduced the outturn below average. Seed rate much below the formulæ (45 lbs.) The sample ser weighed 2 tolas short in this office.
0 8	144¼	29⅔	10⅙	*Experiment No. 96.*—Same crop on unmanured heavier black soil called *yari*. Rotation :—*jowári*, linseed and safflower alternating with wheat and safflower. Season, &c., as above. Yield much below that in the last test attributed in part to indifferent cultivation and in part to the excess of moisture retained by the rich soil from late heavy rains. Seed rate low. Sample two tolas short of the weight recorded by the experimenter.
0 8	144¾	29⅔	10⅙	*Experiment No. 97.*—Same crop on similar soil. Crops grown during the past three years were :—(1) *jowári*, linseed and safflower, (2) cotton, (3) same as (1). Season, &c., as above. Cultivation indifferent; *hariáli* here and there in the field.
0 4	148	44	3⅓ straw, ⅓ chaff.	*Experiment No. 98.*—Continuous rice, *somsáli*, drilled on unmanured fairly good black soil, *hulambiaur holla*, irrigable from a tank in the neighbourhood. It is not stated whether irrigation was applied or required this year. Season and tillage both good. Seed rate compared to the formulæ low. Sample ser received in this office was found to weigh 4 tolas less than the weight recorded by the experimenter. Incidence rather high, attributed to low prices.
0 8	136	70	23½	*Experiment No. 99.*—Italian millet, *navani*, on reddish *masári* land, manured every other year with 5 cart-loads of ordinary manure per acre and growing *jowári* and *navani* with mixtures in alternate years. No manure applied this year. Season very unfavourable to *jowári* which was sown in rows and failed entirely, but not so to the test crop which, compared to the formulæ, gave a 10-anna yield.
0 2	20 weight.	15½	14⅔ green tops, 8½ dry leaves.	*Experiment No. 100.*—Sugarcane, *rasdáli*, on good black soil, *yeri nela*, irrigated from a tank on higher level and also by baskets from a well in the field, once from the former and six times from the latter, thrice before the rains and three times after. *Navani* preceded sugarcane in 1891. Land manured with 4 large cart-loads per acre of cowdung and rubbish, and also with sheep folding for three nights. Tillage good. Seed rate much under-estimated. Season reported to be unfavourable and below average, but the crop undertest gave little short of full average crop according to the formulæ.
0 2	20 weight.	15½	14⅔ green tops, 8½ dry leaves.	*Experiment No. 101.*—Same crop on a different portion of the same field, but grown under different conditions. Land manured with 8 cart-loads of cowdung per acre in January. *Sáva* (Panicum miliare) preceded cane. Crop watered once from the tank and only 3 times after the rains were over. Crop poor and probably correctly estimated at 4 annas, although when compared to the formulæ, it represents a 9-anna crop. Seed rate very low. Tillage inferior; season as above.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	DHA'RWA'R—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. R. E. Kánga, District Deputy Collector.									
102	Navalgund (Navalgund).	Great millet (Kenjwála), 21st November 1892.	11	395	3⅓	495	4,364 kadbi, 200 chaff.	17 1 7	1 5 5 R. S.	7·33
		Green gram (Hesaru), 15th February 1893.	1	2	8	1	222	1 2 7		
								18 4 2		
103	Do. do. ...	Wheat (Godhi), 15th February 1893.	13	525	31½	537	796	20 0 0	1 6 6 R. S.	5·34
		Safflower (Kusubi), 15th April 1893.	20	110	14¾	316 seed.	...	6 5 4		
								26 5 4		
104	Ron (Ron)	Pigeon pea (Togri), 18th March 1893.	11	280	11⅔	614	2,585	25 0 0	1 0 1 R. S.	4·02
	KOLA'BA.									
	Mr. K. N. Bhángáonkar, District Deputy Collector.									
105	Pen (Kámárli) ...	Rice (Mahádya Varangal), 15th November 1892.	16	2,000	49½	2,129 with husk.	2,004	57 14 4	6 12 1 O. S.	11·66
106	Do. (Pen)	Do. (Bhadas), 3rd November 1892.	12	1,250	55½	1,581 with husk.	1,560	40 12 8	5 3 10 O. S.	12·84
	RATNA'GIRI.									
	Mr. G. D. Pánse, Assistant Collector.									
107	Rájápur (Lánje) ...	Panicum maliaceum (Dhamni Varil), 10th November 1892.	14	1,080	2⅔	1,050	1,333	29 11 5	0 5 11 O. S.	1·24

Southern Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Price of Produce per Rupee. Principal Product	By-Product	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
1 0	144	51⅔	6 kadbi, 1⅝ chaff,	*Experiment No. 102.*—Unmanured and unirrigated *jowâri* with subordinate rows of *tur* and green gram on deep black soil, *yeri bhumi*, growing during the past three years wheat, cotton, and *jowâri*. Tillage good. Rainfall timely and abundant; but too much for the *jowâri*, yield from which was poor in consequence. The stubble produced a second growth, owing to abundant moisture. The heads of grain of the ratoon crop ripened unequally and no test was made. *Tur* also being unripe remained untested. Actual area under *jowâri* and green gram reported at 32 and 4 gunthas respectively. Samples of *jowâri* and green gram weighed each 10 tolas more than weights recorded by the experimenter. Reported figures, therefore, doubtful.
	146	26⅕	1⅝	
1 0	154	31⅗	2 5/14	*Experiment No. 103.*—Dry-crop wheat with safflower on similar soil grown without manure or irrigation. Rotation:—wheat and *jowâri* in alternate years. Season very favourable for safflower which throve remarkably well, but wheat suffered a little from excessive moisture. Proportionate area under the two crops as 8 : 1. Sample of wheat weighed 10 tolas more and that of safflower 6 tolas more than the weights reported by experimenter.
	108	49⅕	...	
1 24	114	35	3	*Experiment No. 104.*—Pigeon pea, a subordinate crop in a mixture with *jowâri* and green gram on similar soil, manured with 20 cart-loads of cowdung and rubbish per acre before sowing. Season favourable at first and plants put forth vigorous shoots, but the first flowering destroyed by a kind of grass-hopper *midich*; outturn thereby reduced. Area under *tur* in the test area 8 gunthas only and figures in columns 7 and 8 show acre averages therefrom. Yield, compared to the formulæ, represents a full average crop. Sample weighed in this office 125 tolas. Figures untrustworthy.
0 10	55½	40½	3¼	*Experiment No. 105.*—Continuous rice on first class *garvi* land grown without manure or irrigation. Seed-bed, however, heavily manured with 10 cart-loads of cowdung. Proportionate area of the bed, 8 gunthas to an acre of plantation, rather high. Tillage very good; but season unfavourable, rain having commenced very late and being injuriously heavy at end of October. Sample forwarded to this office, though stated to be an *adholi* (2 sers) by measure, was probably (as in the next test) an *adholi* and a quarter. It weighed 134¾ tolas. If the above assumption is correct, then the sample weighed 54 tolas per ser.
0 10	57	43	6½	*Experiment No. 106.—Bhadas*, an inferior rice, similarly grown on medium, *nimgarvi*, land. Seed-bed alleged to have been 5 gunthas for a field of 1 acre 32 gunthas, must have been insufficient. It was rábed with 10 cart-loads of cowdung; 4 or 5 cart-loads of household manure and cowdung were spread on the inferior portion of the field. Tillage good. Season as above. Sample received in this office was found to give 53½ tolas per ser.
0 8	32	36	19	*Experiment No. 107.—Vari, Dhamni*, on *bharad varkas* land that has to be fallowed for 5 years after cropping it for the same period. Rotation:—(1) *kulith*, (2) *sarvat* rice, (3) *vari*, (4) *harik* and (5) sesamum. 20 bundles grass, 20 head-loads, cowdung, and 8 bundles of *kaval* burnt as ráb on a 2½ guntha bed which furnished seedlings sufficient for an acre and half. Cultivation good and season fair, though late rains somewhat excessive. Seed rate low.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	RATNA'GIRI—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. G. D. Pánse, Assistant Collector—continued.									
108	Rájápur (Lánje) ...	Eleusine coracana (Khandála Nágli), 10th November 1892.	14	1,050	4	829	767	25 6 0	0 4 3 O. S.	1·05
109	Do. ...	Paspalum scrobiculatum (Harik), 10th November 1892.	12	400	24½	785	2,143	7 14 7	0 4 5 O. S.	3·51
	Mr. L. C. Crump, Assistant Collector.									
110	Dápoli (Harnai) ...	Rice (Patnï), 11th November 1892.	16	2,000	66	3,553 with husk.	6,340	120 11 3	9 8 11 O. S.	7·91
111	Do. (Jálgaon) ...	Do. do. 16th November 1892.	16	2,000	76	1,185 with husk.	2,740	33 12 2	4 8 5 O. S.	13·40
112	Do. (Adkhal) ...	Eleusine coracana (Mahán Nágli), 13th November 1892.	13	950	6⅔	567	860	16 11 10	0 3 6 O. S.	1·30
	Mr. K. V. Ghaisás, District Deputy Collector.									
113	Ratnágiri (Hátkhambe).	Rice (Bárik Vánksál), 28th October 1892.	18	1,800	78½	956 with husk.	1,920	25 6 8	1 11 8 O. S.	6·80
114	Do. do. ...	Eleusine coracana (Amáni Nágli), 28th October 1892.	17	1,360	13¾	783	1,225	23 7 10	0 2 7 O. S.	0·68

Southern Division, 1892-93—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Price of Produce per Rupee. Principal Product.	By-Product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	33½	34⅓	5½	*Experiment No. 108.*—*Khandála nágli* on similar soil was the first crop in a rotation, like that noted above excepting that *nágli* takes the place of *kulith*. Seed-bed rábed as above. Seedlings from 1½ guntha gave plants for 35 gunthas. Cultivation and season as above. Seed rate nearly half that recorded in the formulæ. Yield compared to the formulæ, 12 annas. Sample weighed in this office 2 tolas short of the weight recorded by experimenter.
0 8	30½	103¼	6¼	*Experiment No. 109.*—*Harik*, third crop in the rotation, on similar soil. Rotation:—(1) *Sarvát* rice, (2) *nágli*, (3) *harik* and (4) sesamum, and then fallow for 4 years. Seed-rate, compared to the formulæ, very high; so also is the yield which represents a 19-anna crop according to that standard.
0 4	43	35¼	2⅔	*Experiment No. 110.*—Continuous rice *patni*, planted on first class *pánthal* land. Seed-bed, 8 gunthas to an acre of plantation, liberally rábed with 160 head-loads of cowdung and 110 of grass burnt in April. Season favourable. Crop best in the locality and yield ¾th as much again as that recorded in the formulæ for an average crop, attributed to richness of soil and careful tillage. By-product valued rather high.
0 4	43	39⅔	6¼	*Experiment No. 111.*—Same crop on low lying flat middling rice land, 5 head-loads of cowdung, 13 of grass and 8 of dry leaves burnt as *rábed* on a 16 guntha seed-bed, said to have been used for an acre of plantation. Proportionate area of seed-bed very high. Season only fair. Cultivation bad; and outturn compared to the formulæ, less than 12 annas.
0 8	52	37⅓	5	*Experiment No. 112.*—*Nágli, mahán*, first crop taken after 4 years' fallow on *varkas bharad* land growing in succession rice, sesamum and *harik* after it. Crop raised from seedlings; 8 gunthas of seed-bed to acre of transplantation. Seed-bed rábed with 10 head-loads each of cowdung, grass and *kaval*. Tillage good, but season only fair, owing to heavy rain which somewhat damaged the crop. Outturn less than 11 annas according to the formulæ.
0 4	41⅞	43	5⅓	*Experiment No. 113.*—Inferior rice, *bárik vánksál*, grown from sprouted seeds on land newly reclaimed from *varkas* soil, locally called *kudyat kharif*, which was lightly dressed per acre with 15 head-loads of ordinary refuse before commencement of rains and 10 head-loads of cowdung at the time of sowing. Cultivation good, but season somewhat unfavourable, rains having begun only a tend of June. They however continued late and made up the deficiency to a certain extent. Seed rate higher than that in the formulæ and outturn less than 12 annas according to the same standard.
0 8	50½	36¼	5⅝	*Experiment No. 114.*—*Amáni nágli* on inferior *varkas bharad dongri* land, on which no crop taken for the past 10 years. Seed sown in a seed-bed, 5 gunthas to an acre of plantation, rábed with 30 head-loads of *kaval*, 20 of cowdung, 2 of *harken* (*harik* straw) and 40 bundles of grass, all covered over with sifted earth about 1½ inch deep and then burnt. Seedlings planted 2 to 3 inches apart, in a field seven times ploughed. Manured with a piece of dry fish at the root of each. Season favourable and tillage good. Seed rate double that of formulæ. Yield less than 12 annas in comparison with same standard.

Summary of Crop Experiment Reports,

O. S. = Original Survey ;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of Gross Produce.
						Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10	11
	RATNA'GIRI—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. K. V. Ghaisás, District Deputy Collector—continued.									
115	Sangameshwar (Jangalwádi).	Panicum maliaceum (Kárláchi Máhán Vari), 8th November 1892.	15	1,480	4	699	985	15 5 3	0 3 8 O. S.	1·49
	KA'NARA.									
	Mr. N. B. Divátia, Assistant Collector.									
116	Kárwár (Shirwád) ...	Rice (Kále Pándya and Sánmalgi), 3rd November 1892.	12	750	179½	1,303 with husk.	1,577	29 7 10	5 0 0 O. S.	16·96
	Mr. C. W. Hudson, Assistant Collector.									
117	Kárwár (Bád...) ...	Do. (Sanna Malagi), 2nd November 1892.	16	1,200	160½	2,233 with husk.	3,701	48 2 7	4 15 0 O. S.	10·24
118	Kumta (Kujali) ...	Do. (Váingan, Kempi Bhatta), 13th April 1893.	16	...	188	2,640 with husk.	2,990 straw, 86 chaff.	60 13 3	5 2 11 O. S.	8·52
119	Honávar (Hadkesirur).	Do. do. 15th April 1893.	20	...	206	2,250 with husk.	3,433 straw, 63 chaff.	53 4 6	4 2 9 O. S.	7·82
	Mr. J. L. Lushington, Divisional Inspector, L. R. and Agriculture, S. D.									
120	Haliyál (Ámbeli) ...	Do. (Sorta, Váingan), 9th May 1893.	13	...	134¾	2,284 with husk.	4,128	60 8 0	2 7 2 O. S.	4·04

Southern Division, 1892-93—concluded.

R. S. = Revision Survey.

Area of Test.		Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
			Principal Product.	By-Product.	
12		13	14	15	16
A.	g.	Tolas.	Lbs.	Cwts.	
0	8	47	$48\frac{1}{5}$	$10\frac{5}{7}$	*Experiment No. 115.*—*Vari*, locally called *kárláchi máhàn*, planted on superior *mál, varkas* land that lay fallow for 10 years and grew *harik* and *nágli*, during the previous two years. Seed-bed used for an acre, $6\frac{1}{4}$ gunthas, on which 50 head-loads of *kaval*, 25 baskets of cowdung, 25 bundles of grass and 5 of *harken* were burnt as ráb. Cultivation indifferent. Season favourable, but untimely rain after the crop was ripe caused some shedding of grain. Compared to the formulæ yield less than half.
0	4	60	46	$11\frac{1}{10}$	*Experiment No. 116.*—Rain crop rice sown broadcast on reddish soil lightly manured before sowing with 8 baskets or about 9 cwts. of cowdung composted with dry leaves per acre. Season favourable at first, but the prolonged heavy rains in October-November damaged the standing crop to some extent. Tillage indifferent. Seed rate compared to the formulæ (120 lbs. per acre) high. Outturn $1\frac{3}{4}$ times that recorded in the formulæ for a 12-anna crop. Two varieties (red and white) grown in field.
0	$5\frac{1}{4}$	$59\frac{5}{8}$	51	$4\frac{5}{8}$	*Experiment No. 117.*—Monsoon rice sown broadcast on muddy land, *Kesarin bhumi*, that grows rice continuously for four years and sugarcane in the fifth. Field manured with 300 head-loads per acre of a compost of dry leaves, ashes, stable refuse and cowdung. Season favourable and crop would have been bumper, but for untimely heavy rain at end of October which washed away some of the grain from the ripe ears. Outturn, however, nearly double that recorded in the formulæ for a 16-anna crop and nearly equal to that of planted rice.
0	4	$54\frac{1}{2}$	$46\frac{5}{8}$	$7\frac{1}{7}$ straw, 5 chaff.	*Experiment No. 118.*—Rabi or *váingan* rice, *kempi bhatta*, on rich clay land lying between two hills and watered of itself owing to natural declivity from springs, a mile distant. The drainage from the springs afforded moisture for more than 200 acres. Two rice crops grown every year. The rain crop was manured with dry leaves and the rabi one received a light dressing of 10 head-loads per acre of decomposed cowdung and leaves. Crop said to have suffered a little at an early stage from excess of water supply due to heavy October rains. Tillage good. Sample of *kolaga* (3 sers) received in office showed a deficit of 6 tolas.
0	4	$53\frac{1}{2}$	$45\frac{2}{3}$	$8\frac{1}{7}$ straw, $3\frac{5}{7}$ chaff.	*Experiment No. 119.*—Same crop on similarly situated land with equal facilities for irrigation. Land more liberally manured with 300 head-loads per acre of rotted leaves and cowdung. Season, &c., as above. Crop said to have been the best harvested during the past ten years and, therefore, valued at 20 annas, though compared with the test above, the yield is less by 400 lbs. and is nearly equal to that reported below. Straw weighed when fresh cut.
0	5	73	46	$3\frac{5}{14}$	*Experiment No. 120.*—*Váingan* or hot weather rice on brown, *mangat*, soil growing two rice crops every year. Land not manured for the rain crop, but for the second the seed-bed received 7 tons, and the other portions $4\frac{1}{2}$ tons per acre of cowdung and sweepings. Water, from a perennial stream about 300 yards distant dammed annually at a cost of about Rs. 30, more than sufficient for irrigating the field. Tillage careful. By-product weighed when fresh cut. Incidence on the second crop alone. The experimenter forwarded to this office a *pound* sample of grain instead of the contents of a *local measure ser* as required by standing orders.

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1893-94.

[Price—10 Annas.]

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

CROP EXPERIMENTS,

BOMBAY PRESIDENCY,

1893-94.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

CONTENTS.

	Pages.
I.—Forwarding Letter	i—v
II.—Analysis—	
Northern Division	1—20
Central Division	21—40
Southern Division	41—56
III.—Tabular Summaries—	
Northern Division	58—69
Central Division	70—81
Southern Division	82—93

No. $\frac{A}{3671}$ OF 1894.

FROM

E. C. OZANNE, ESQUIRE, I.C.S., M.R.A.C.,
Survey Commissioner, and Director, Land
Records and Agriculture, Bombay;

To

THE HONOURABLE JOHN NUGENT, ESQUIRE, I.C.S.,
Chief Secretary to Government,
Revenue Department, Bombay.

Poona, 1st December 1894.

SIR,

I have the honour to submit the Annual Report on Crop Experiments for 1893-94, which has been again admirably drawn up by Mr. J. W. Mollison, M.R.A.C., Superintendent of Farms. The report is annually increasing in bulk, and its submission before the opening of the fair season becoming more and more difficult. As, however, previous Analyses deal so fully with points of doubt there is not the necessity that once existed of immediately placing the compilation into the hands of Revenue officers for guidance. I felt inclined to expedite publication and diminish bulk by confining the report to an exhibition of the tabular summaries, with some enlargement of the details shown in the column of remarks in the summaries; but a perusal of Mr. Mollison's comments will, I think, show that such a course would greatly detract from the value of the compilation. Its value is very considerable. Not only does it annually give a large amount of information as to agricultural practices, and thus stimulate agricultural enquiry, but it contains free criticism of the burden of the revenue demand, not only by the experimenters, but by a trained agricultural expert. I think then that the only wise method of curtailment is to omit all reference to experiments which fail to reach a fairly satisfactory standard, the explanation for rejection being given in a separate report to the Commissioners. This method of curtailment I propose to adopt in future.

2. The work done is shown in the usual table, thus :—

Division.	EXPERIMENTS, 1892-93.		EXPERIMENTS, 1893-94.	
	Reported.	Rejected.	Reported.	Rejected.
Northern Division	54	...	44	1
Central Division	34	5	45	20
Southern Division	32	2	45	2
Total ...	120	7	134	23

The increased importance with which Government views this work, as a means of preparation for the next quinquennial return of yield statistics required by the Secretary of State, induced an increase of 80 per cent. in the number of experiments last year on the average of the preceding six years, which increase has now risen to 100 per cent. Preference has been given to ordinary experiments over the "special" experiments of the kind first prescribed in 1881, chiefly because the former are less difficult and afford equally good information as to yield, which is the point at present under special study.

3. Of recent years a programme for each district has been suggested by the Director, in order to secure tests on those crops of which the yield figures are least known or most important. The crops subjected to test this year are shown in the following table. Those for which information is required in the quinquennial return are marked with an asterisk :—

Division.	Jowári.*	Bájri.*	Rice.*	Wheat.*	Barley.*	Kodra.	Ragi.*	Vari.	Tur.	Gram.*	Potatoes.	Onions.	Sugarcane.*	Sesamum.*	Linseed.*	Niger seed.	Ground-nut.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Northern Division ...	...	7	8	4	2	...	5	...	...	9	1	...	4	4	...	...	...	44
Central Division ...	9	7	1	7	...	...	1	...	...	8	...	1	4	...	3	...	4	45
Southern Division ...	9	8	9	...	...	3	9	2	1	2	...	...	...	...	1	1	...	45
Total ...	18	22	18	11	2	3	15	2	1	19	1	1	8	4	4	1	4	134

Northern Division.

4. The number of experiments as compared with last year shows a slight decline. The Superintendent of Farms took one test in Surat. No help was received from Survey officers; the one report which was submitted by Mr. Forbes being excluded for reasons recorded. Messrs. Doderet (Surat), Phirozsháh (Broach) and Patvardhan (Thána), have submitted valuable reports. Mr. Pránlál (Panch Maháls) has not succeeded so well as last year. On the whole the standard of quality in the Northern Division is very fair.

5. In this Division, revision settlements are in progress, and in Surat and Broach it has yet to be decided whether the current rates shall be re-guaranteed without modification or whether they require re-distribution, even though a net reduction in some tálukas be the final result. The experiments of the year are important and give evidence that the distribution of the revenue demand in Broach and Surat is not equal and its pitch high in comparison with the standard in the revised portions of the province. Mr. Mollison, however, shows that Mr. Doderet has not fully made out a case of inequality of rating in Nos. 30 to 32. I have thought it necessary to make special enquiry on the Broach and Surat experiments and append the results to this letter. In Broach, Surat and Thána, where the original survey rates have not been revised, Mr. Mollison's careful criticism will receive special attention from the Settlement officers. It is satisfactory to notice that in revised districts there is small evidence either of excessive or of unequal assessments. No one who studies the compilation with intelligence will be misled by occasional high percentages in column 11, where the incidence is calculated on second crops alone as Mr. Mollison shows that the cost of cultivation of such crops is very small and that a comparison should rather be made between the figures of columns 9 and 10. I explained last year that a high percentage incidence in valuable productive land leaves a higher actual profit than a much lower incidence in poor land. In the Northern Division the range of assessment is greater than anywhere else in the Presidency, a natural consequence of the corresponding range in productive value, as well as evidence of the adaptability of the survey valuation throughout.

6. Gujarát is also remarkable for striking contrasts in the skill of its cultivators, but it is satisfactory to notice that in Broach and Surat (Nos. 29 and 33) Koli cultivators are not always poor farmers. The great value of the concession made at revision under which direct well assessments are being eliminated in Gujarát, is well exemplified in experiments Nos. 9 and 10. The value of the allowances made by survey principles for outlying fields is also evidenced by Mr. Phirozsháh's experiment (No. 29). Outlying fields are seldom manured, both because the available supply is preferably utilized nearer home, and because the cost of carriage to distant fields and the loss of time are considerable.

7. Mr. Mollison's conclusion must be accepted that even where, as in Broach and Surat, assessments appear high, there is a liberal margin of profit to those who farm well. At the same time Mr. Mollison cannot refrain from saying that in Broach the proportion of liberally cultivated dry-crop land is small in comparison with that where the cultivation is negligent and where in consequence the incidence of assessment is felt.

8. The high rental obtained by sub-letting is evidenced in experiment No. 33.

9. In several cases evidence is forthcoming of the incorrectness of the standard formulæ prepared some years ago. These corrections are specially valuable in view of the obligation imposed by the Secretary of State to make all efforts possible to improve present knowledge in this respect.

Central Division.

10. The number of reported experiments shows a material increase, but this is due to the assistance of the Survey Department, the Divisional Inspector and the Superintendent of Farms. The experiments made by the two last named officers are of special value, as indeed they should be. Mr. Hampton, Assistant Superintendent of the Survey Department, is a measuring Assistant, with no special experience in this kind of work, but his energy in the matter is commendable. Most of his experiments have, however, been rejected for reasons recorded. In my opinion it would have been better if experiments Nos. 52, 53, 56 to 60 and 78 had also been excluded from the tabular summary. Mr. Chitgubi and Mr. Kázi Kamruddin in Khándesh and Mr. Thatte in Násik are still considerably below the standard which Revenue officers have generally reached. Mr. S. Padamji of Ahmadnagar shows much improvement and the work done by Messrs. Arthur and Cursetji in Sátára is very satisfactory in quality.

11. No suspicion of over-assessment is raised by any of the experiments, except perhaps that by No. 56, but, as has already been said, Mr. Thatte's work is not careful. There is ample evidence, on the other hand, that where capital has been laid out either in good cultivation (Nos. 70, 76 and 77) or in land improvement (No. 87), the incidence of assessment is an almost negligeable quantity.

12. Five experiments (Nos. 57, 58, 74, 75 and 89) were taken on land assessed as *pátasthal*. The incidence is very light.

Southern Division.

13. The improvement in the number of experiments is considerable, but their value is reduced by the selection in so many cases for test one only of the crops in a mixture. In drawing up the programme for experiments during the current year experimenters have been invited as far as possible to select crops grown alone on a set area or else to include in the test all the crops of a mixture. It will have to be seen how far this advice can be followed. For the reasons recorded in his comments on several experiments by Mr. Mollison, it is impossible to judge of the burden of the assessment except by dealing with crop mixtures thoroughly or by avoiding them in selecting crops for experiment. The difficulty will be most felt in Dhárwár, Bijápur and Belgaum.

14. Several officers have done valuable work in this Division. Messrs. Batchelor (Bijápur), Kánga (Dhárwár), DuBoulay (Kolába), Kamlápurkar (Ratnágiri), and Divátia (Kánara) may be mentioned. Mr. Pánse in Ratnágiri chose exceedingly poor data as a basis for his voluminous remarks. Only two experiments have been rejected, sufficient reasons having been recorded in both cases.

15. As regards the Karnátak districts the experiments go to show a low incidence in assessment both in the opinion of the experimenters and in that of their reviewer, as well as a reasonable gradation of the valuation according to the agricultural value of the land as shown by crop results when differences due to neglectful cultivation and the like are eliminated.

16. The experiments in Kolába are valuable as justifying the treatment at revision survey of *várkas* and *rabi* lands insufficiently appreciated at original survey. In experiments Nos. 114 to 116 the assessment still current was badly graduated and excessively low. The latter remark applies to No. 118. In all

these cases, even allowing for fallow, the rent charge is less than one-hundredth part of the value of outturn on the area cropped, even in the case of the second crop after the fallow. Experiment No. 120 shows that *rabi* land was better appreciated in southern than in northern Kolába at the original survey.

17. With respect to the Collector's remark below experiment No. 118, I need only say that I have demonstrated that grass and household refuse of sorts cannot alone make a good rábed seed-bed. On the other hand cowdung is, as the Collector supposes, more valuable than tree-loppings, but its supply is nowhere sufficient for rább.

18. The information obtainable from the experiments in Ratnágiri as regards burden of assessment is somewhat scant, but I think that even with the clearly proved inadequacy of the rább supply the assessment is nowhere shown to be unreasonable.

19. In his remarks on Mr. Pánse's experiments, Mr. Mollison has fallen into an apparent error. The minute division of land into *pot* numbers was not the cause, but the result of minute sub-division of holdings.

20. The experiments made do not prove over-assessment in Kárwár, but if local officers have formed that opinion it rests with them to produce evidence more conclusive than that now afforded by the papers. The revision of the Kánara settlements cannot result in any taxation of the improvements made by private capital. The tagái reports for the last year give satisfactory evidence that great improvement is going on in Kánara with the liberal encouragement afforded by Government, with full confidence on the part of those interested that they will enjoy the full results of their enterprise.

I have the honour to be,

Sir,

Your most obedient Servant,

E. C. OZANNE,

Survey Commissioner, and Director,
Land Records and Agriculture.

P. S.—This review has been delayed in order that fuller information than that afforded in the crop report might, if possible, be obtained where the incidence of assessment on gross produce exhibits a high rent charge, which in cases is so high as apparently to leave not only no margin of profit but an actual loss to the cultivator, even if the cost of cultivation be taken at a very small figure.

Broach.

In Broach all the experiments made by Mr. Leggatt (Nos. 24 to 26) are conspicuous instances of extraordinary results, while those made by Mr. Phiroz-sháh (Nos. 27 to 29) demand some comment.

The Broach district is still under original settlement. I have already noticed Mr. Mollison's opinion, expressed in his analysis, that in Broach the incidence of assessment on all dry crops, save cotton grown on really first class black land, is seldom less than 20 per cent. of the gross yield; and that in the highly assessed rice (*kiári*) land, nothing but careful and laborious cultivation will pay. But there is an element in assessment which has not been adequately noticed either by Mr. Mollison or by the experimenters themselves, which has special reference to the cases under comment, *viz.* the heavy direct charge on both dry-crop and rice land where well irrigation is available and actually utilized. The orders of Government as to all Gujarát are that such direct well assessments shall at revision be taken off absolutely. The facility for, and not the use of, well irrigation is taxed under the subsoil water rules to prevent a too heavy charge on those cultivators who have spent money on wells, who are not, according to present policy, liable to be charged a higher assessment than those who have the same facilities, but who have not used them.

The total loss of the Survey Records in Gujarát by the fire of 1887 makes it impossible to state the exact elements in the assessment of each field. More information than now at hand may be obtained from the village papers, but I cannot delay this report to examine those records.

Experiment No. 24.—If, as stated, the field is cotton soil and not rice land, the assessment even on 16-anna soil cannot be above the maximum rate for dry-crop, which in this village is Rs. 6-8-0, but Mr. Leggatt shows an incidence of Rs. 19-8-0. It can only be conjectured that the field is assessed heavily for a well in the field itself, or in an adjoining field, over which the occupant has a right. The charge per *kos* (water-lift) on wells in Broach at the original survey was as high as Rs. 33-8-0, a charge which was distributed over the area with right to the water. Mr. Leggatt gives no hint that such a well exists, nor does the rotation shown indicate its existence; still, without a heavy charge on a well, the assessment reported could not have been levied.

Experiment No. 25.—The village is largely a *bhátha* village, *i. e.* made up of alluvial deposits from the Narbada, which are of extraordinary value, though liable to occasional damage of a serious nature if the floods are unseasonable. The highest possible assessment for *bhátha* land in this village is Rs. 17-8-0, while the assessment is shown by Mr. Leggatt to be Rs. 11-3-1 per acre. But he says it is black soil, and black soil is not *bhátha*. I made some remarks on *bhátha* in my last year's review, to which I again invite attention. If the field is not *bhátha*, it may be black soil with a direct well assessment, but no indication in the report supports this conjecture.

Experiment No. 26.—Black cotton soil without irrigational facility, as this is reported to be, could not bear an assessment above the maximum rate (Rs. 5-8-0) for the village.

Further enquiry then is necessary in each one of the cases which are the subjects of these experiments.

Experiment No. 27—Chorási.—The highest assessment on rice land in this village (maximum rates—soil Rs. 6-8-0, and water Rs. 5-8-0) when the water in a tank or fresh water stream is not sufficient for a second crop after the rice, would be Rs. 12-0-0. With perennial water the assessment might have been as high as Rs. 17-8-0; but in this case, though apparently some charge was made for the clearly indicated facility for growing a second crop with the moisture left after the rice is reaped, the charge for second crop could hardly have exceeded Re. 1-6-0. Though the acre incidence is high there is a good and sufficient margin of profit. Last year I showed that in highly assessed land a high incidence is fully justifiable, and really a smaller rent charge than a lower incidence on poor and lightly assessed land.

Experiment No. 28.—This is a case of dry-crop assessed for a well under the old *bágáyat kasar* system. As such, the assessment is not high, but in the year under report only a dry crop was taken in the rotation.

Experiment No. 29.—Ordinary dry-crop with a fair assessment, as shown by the results. The cost of cultivation of dry-crop wheat is very small.

Surat.

Experiments Nos. 30 to 32 were taken in Bulsár, where the old survey rates still in force, are for soil Rs. 4-8-0 and water Rs. 12-0-0 in rice land. In none of the three cases is the incidence excessive. In No. 32 there is tank assistance, where the assessment for rice land might be as high as Rs. 22-8-0. As the assessment is higher than this figure, it may be presumed that this field has an increment for close proximity to the village site, and that it has been classed also at almost the maximum asssessment. No doubt also it takes a high charge for second crop as the experimenter states that a crop after rice is grown annually.

Experiment No. 33.—Maximum rates—soil Rs. 5-0-0 and water Rs. 9-8-0. The field has also well assistance or direct charge for well irrigation. The assessment cannot be fully explained without further enquiry.

Experiments Nos. 34 to 36 are in Olpád, a táluka under revision operations, though a revision of the settlement has not yet been finally sanctioned, pending consideration of a detailed report as to whether the Surat district shall be revised or whether current rates shall be extended for a further lease. There is nothing in these reports to show that the assessments are excessive.

9th December 1894. E. C. O.

ANALYSIS OF CROP EXPERIMENTS.

NORTHERN DIVISION.

Ahmadabad.

The programme settled for this district was only partially followed. Mr. Curtis was asked to take tests on wheat, *juvár* and gram. He reported two tests on barley and one on gram. Mr. Kábráji should have conducted tests on wheat, cotton and *juvár*. He dealt with the first only. The District Deputy Collector was directed to experiment on *bájri*, sugarcane and gram. He submitted two tests on each of the last two.

Mr. G. S. Curtis, Assistant Collector,

Reports two tests on barley and a third on gram. The barley fields (Exp. Nos. 1 and 2) are each classed as garden land, are each irrigable from a well and are assessed respectively at Rs. 5-2-0 and Rs. 3-13-0 per acre. Barley was a second crop in each field, following rice in the first field and *juvár* in the second. The sequence of crops taken during the last three or four years indicates that an exhaustive rotation is practised. The first field grows rice every year as a rain crop and commonly barley as a cold weather irrigated crop. The second field grows *juvár*, rice and *bájri* in consecutive years, as rain crops and generally barley as a second crop. The first field was manured for the rice crop with castor cake, approximately 6 cwts. per acre being given. The second field was directly manured for the barley, 9 cart-loads of ordinary manure per acre being applied. The occupant of each field is a Pátidár and the cultivation is described as good; but rust (*geru*) damaged each crop a good deal. It is certain that the reported seed rate, 246 lbs. per acre, of the first field is much too high; that of the second field, 143 lbs. per acre, is nearer correct. The seed was drilled in each case early in November. The first crop was ripe on the 5th of March; the second on the 17th. The extent of irrigation is not reported, but the heavy rainfall left plenty of water in the wells. The outturn, &c., results are tabulated below:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 1) ...	10 to 11	795	205	16 12 0	5 2 0	30·59
Second do. (Exp. No. 2) ...	11	1,124	410	24 6 7	3 13 0	15·61

The proportionate weight of straw to grain is very small in each case. So much so that I doubt the accuracy of the by-product figures. The percentage incidence of the first test appears high. It would be considerably lessened if count be taken of the value of the rain crop, and if the crop under test had not been seriously damaged by blight.

Gram, the subject of this officer's third test (No. 3) yielded well. The occupant of the field is a Koli, and his cultivation, like that generally of his caste, was indifferent. No manure was given. Gram was the sole crop this year as well as last. In the two previous years the field grew *bájri* with cotton, and *bájri* with castor seed. The field has *gorádu* soil, and bears an assessment of Rs. 3-0-11 per acre. No doubt rain crops could be grown every year. The heavy rainfall of the year presumably gave the soil sufficient moisture for the gram. The

reported seed rate, 184 lbs. per acre, is much too high. The outturn is estimated at 16 annas and a yield of 1,241 lbs. pulse per acre is valued at Rs. 28-5-9. The by-product is reported to have no market value, although the husk and chaff are fed to cattle. The incidence works out 10·73 per cent, which, considering that the land is capable of growing rain crops, is, I think, fair.

Mr. J. K. N. Kábráji, Assistant Collector,

Reports three wheat tests. The first two (Nos. 4 and 5) may advantageously be compared. The fields adjoin. Both are more or less impregnated with salt. The field that lies lowest is visibly impregnated most. This field bears a higher assessment than the other. The respective rates are Re. 0-14-4 and Re. 1-6-4 per acre. The soil in each case is black. No manure was applied to either field. The season was suitable and the tillage is reported as good. The higher assessed field, the field with the most salt, produced the worst crop. Each crop is valued at the average standard. It is not clear why the crops should bear the same anna valuation. The experimenter does not pointedly say that he questions the comparative fairness of the assessments levied on each field. But the inference is that he does, and that the tests were undertaken partly for the purpose of showing that the burden of assessment on the one field is not so fair as that on the other.

Ordinarily each field grows *vari* every year. This year in each field *vari* was a comparative failure. In the previous year also *vari* failed in each field. It is not reported whether these failures are attributable to excess of salt in the land or to unfavourableness of season. It is reported, however, that the field with most salt always grows the worst crop of *vari*. Wheat was grown in these fields, because the heavy late rainfall seemed suitable for the crop. To a certain extent the cultivation was experimental, as only once had this cereal been tried previously, and only in one field, and then it proved a failure. The field with least salt had a dressing of manure in the previous year, when the crop to which it was applied failed. The field with most salt has not recently been manured. Each crop was drilled. The seed was sown in each field about the same time, and the test areas were harvested on the same day. The seed rates differ somewhat, that of the salt field being the highest. The cultivation of each crop in other respects was the same. At least there is nothing to the contrary reported. The by-products were neither weighed nor valued. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn of grain per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (slightly salt) (Exp. No. 4).	16	631	16 5 3	0 14 4	5·48
Second do. (more salt) (Exp. No. 5).	16	328	8 7 10	1 6 4	16·44

The above figures indicate that the burden of assessment is heavier in the second field than in the first, but it would be unwise to conclude that such is the case without fuller information in particular as to the skill and caste of the respective occupants.

The third wheat test (No. 6) was taken on black cotton land. The field grows wheat and cotton in rotation, wheat being taken when the rainfall is too heavy for cotton. This year cotton had actually been sown, but a late heavy rainfall damaged it to such an extent that it was ploughed up. Wheat of course benefited by the tillage for the cotton, also by the abundant late rainfall. There was almost too much moisture for the crop. It was slightly damaged by rats. The crop was sown seasonably. Forty-nine lbs. per acre is the reported seed rate. No manure was applied this year. The land bears an assessment of Re. 1-3-2 per acre. The crop ripened early in March and yielded 682 lbs. of grain per acre, worth Rs. 17-10-8. This is locally estimated as a 14-anna outturn. The

by-product was neither weighed nor valued. The incidence works out 6·78 per cent. and the burden of assessment is apparently fair.

Mr. Motilál Chunilál, District Deputy Collector,

Reports two gram and two sugarcane tests. The former I will first contrast. The crops selected (Exp. Nos. 7 and 8) in each case were the best in the village. This is against standing orders, unless the experimenter had a special object in view, which does not appear to have been the case. The first field is *kiári, i.e.*, embanked land. It bears an assessment of Rs. 3-7-8. In 1892-93 wheat and cotton were grown. This year gram followed a rain crop of *vari*. The field was manured for the rain crop with 12 loads per acre cattle manure. Tillage and season were both good. The gram was sown in November through a single tube affixed behind a plough. The seed rate, 47½ lbs. per acre, is about normal. The crop ripened early in February.

The second field is classed as *jirâyat* or dry-crop land. It is assessed at Rs. 2 per acre. It lay fallow for 4 years prior to 1892, but for what reason is not reported. In 1892-93, gram only was grown. This year *til* was sown as a rain crop. It was washed away by flood water. Gram was sown, as in the first field, behind the plough; but the reported seed rate, 10¼ lbs. per acre, is, I am sure, an under-estimate. No manure was applied. Tillage and season were each good. The outturn is remarkable and indicates the fertilizing power of fallowing. On the other hand, the anna valuation by local cultivators is so low that I almost doubt the correctness of the experimenter's outturn figures. No value is put on the by-product in either test. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn of pulse per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 7) ...	8	615	11 4 0	3 7 8	30·92
Second do. (Exp. No. 8) ...	10	1,790	32 11 9	2 0 0	6·11

The first field is probably capable of growing double crops each year; and if the value of the rain crop be added the incidence would be considerably reduced. Even on the second crop a margin of profit would be left to the occupant, as the cost of cultivating gram is light.

This officer's sugarcane tests (Nos. 9 and 10) are not in all respects satisfactory. I think the principal product (*gul*) and the by-product (green tops) are valued at an inordinately high rate. On reference the experimenter says that the reported rates for *gul* are correct. The *gul* of each crop is valued at 9 1/10 lbs. per rupee. This would be a very high retail rate, and the difference between wholesale and retail prices is always considerable. The prices quoted in tests on sugarcane in previous years vary from 14 lbs. per rupee, when *gul* was dear, to 22 lbs. per rupee when it was cheap. This year the price quoted by an officer who experimented on sugarcane in the Surat district is 22½ lbs. per rupee. In the Poona district the best *gul* this year was saleable at 17 to 18 lbs. per rupee.

The fodder value put upon the green tops is also very high. This by-product is valued per acre at Rs. 52-8-0 in the first test and at Rs. 41-11-6 in the second. I think it is certain that the reported value of gross outturn of each field would be reduced by nearly half if valued at ordinary wholesale rates.

The first field is classed as ordinary dry-crop land, but at least a portion of it is irrigable from a one *mot* well. The field grew cotton in 1891-92. A rain crop was not taken in 1892, but the land was apparently got ready for sugarcane, which was planted in April 1893. A white variety was grown. The field bears an assessment of Rs. 3-6-0 per acre. It was liberally manured by folding sheep in December 1892 and January 1893. During February, camels were tied in the field, presumably like the sheep, only at night. In the month of March cattle manure, 40 cart-loads per acre, was applied. Castor cake, about 2,700 lbs. per acre, was applied after the cane had made some progress, as a preventive

against damage by white ants. It would also, of course, act as a valuable manure. The cost per acre for manure is as under :—

	Rs.	a.	p.
Sheep folding	25	0	0
Camel do.	10	0	0
Cattle manure	40	0	0
Castor cake	33	8	0
Total ...	108	8	0

The experimenter estimates the cost of cultivation, but I cannot accept the figures. Many items are very wide of the mark. The cost of irrigation is for 18 months, whilst the crop only occupied the field about 10 months. Probably the land was occasionally watered before planting to admit of ploughing. Sets are said to have cost Rs. 90 per acre, that being the estimated value of 1,125 canes. These canes are reported to have been cut each into 3 sets. If the canes were very large, they might have provided sets sufficient for an acre, but the sets for an acre need not necessarily cost more than Rs. 40 to Rs. 50. Season and tillage are described as good. Details of cultivation are not reported.

The second field is also classed as *jirâyat*; but the portion under sugarcane is *bâgâyat* in this sense that it is commanded by a double-*mot* well and that irrigated crops of chillies, brinjals, wheat and sugarcane are grown. The assessment is Rs. 2-8-7 per acre. Black or dark coloured sugarcane was grown. This variety is hard. It yields less sugar than the white. But on the other hand, it is less liable to disease and to damage by jackals, rats, &c. The crop is reported fair. Like the white cane it was the best crop of the village; but it is only estimated at 4 annas. For this crop 1,330 canes, each cut into 3 pieces were used as sets. The cost of sets is estimated at Rs. 79 per acre. This is high. The field was manured with 60 cart-loads per acre of cattle manure before plantation, and with approximately 1,880 lbs. of castor cake per acre as a top-dressing when the crop had made some progress. The whole application of manure cost approximately Rs. 113 per acre. The crop was about 10 months growing. The comparative outturn, &c., results from each crop are given below :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.			Assessment per Acre.			Percentage incidence of Assessment.
		Gul.	Useful by-product.							
	As.	Lbs.	Lbs.	Rs.	a.	p.	Rs.	a.	p.	
First field (Exp. No. 9) ...	16	7,736	16,820	901	0	6	3	6	0	0·38
Second do. (Exp. No. 10) ...	4	4,738	13,350	561	11	6	2	8	7	0·45

The following results were obtained from the 8-guntha test area of each field :—

	White cane.	Dark cane.
Number of canes	7,332	8,748
	Lbs.	Lbs.
Weight of canes topped and stripped...	11,980	8,792
Weight of tops	3,364	2,670
Weight of juice	8,935	6,899
Weight of *gul*	1,547	948
Percentage, juice to cane	74·6	78·6
Do. *gul* to juice	17·3	13·7
Do. *gul* to cane	12·8	10·8

Kaira.

Only four experiments have been reported from this district. *Bájri* was the crop selected for this year's tests. Mr. Atkins could not carry out any tests on that crop owing partly to his absence on leave and partly to his finding no suitable crop on his return conveniently situated for experiment. Mr. Sorábsha conducted 3 tests on *bájri*.

Mr. J. DeC. Atkins, Assistant Collector,

Reports a gram experiment (No. 11). The field measured 27 gunthas and the whole area was tested. No doubt the correct acre outturn was thus obtained. A good crop of gram has no great bulk, and it is possible to test a large area of this crop with less expenditure of time and trouble than a smaller area of almost any other crop. There can be no objection in making the whole of the gram field the test area if the field is small. In another direction the experimenter struck out a line for himself which is wrong. He does not report the local anna estimate of the crop, because he distrusts anna estimates.

The field has black soil assessed at Rs. 3-11-3 per acre. Rice is taken every year, and a second crop when there is favourable late rain. This year November rain induced the cultivator to sow gram. The seed was drilled. The reported seed rate, 59 lbs. per acre, is high. The soil, however, may have been ploughed up rough, in which case a higher seed rate than usual would have been required. The field was liberally manured for the previous rice crop. The by-product is reported worthless for every purpose. This is not so. Four hundred pounds pulse per acre is valued at Rs. 9-1-2. The gram is valued very cheaply at 44 lbs. per rupee. It is probable that, though the incidence of assessment works out 40·81 per cent., there was a small margin of profit left to the cultivator, because the cost of cultivating gram after rice is always light. The cultivator, a Pátidár, appears to have been satisfied. He said the crop was as good as he expected.

Mr. Sorábsha Hormasji, District Deputy Collector,

Sends three *bájri* tests. Two of the fields (Exp. Nos. 12 and 13) grow pulses subordinate to the *bájri*. The subordinate crops were not tested, and, therefore, the results from the *bájri* alone form no guide as to the fairness of the burden of assessment. The experimenter tries to apportion the area under *bájri* in each of the mixed crop fields in ratio to the weight per acre of different seeds sown. Nothing could be more fallacious; for it is the character of the season and not the seed rate which will determine which crop or crops of a mixture will succeed best. On reference it has been reported that the subordinate pulse crops promised to yield well in each of the fields. It is probable that the mixed crop of the first field yielded better than the mixed crop of the second, because the former gave much the best *bájri* crop, yet without authentic figures as to the outturn of the pulse crops the reverse might actually be the case. Each field has *goráda* soil. The first field is assessed at Rs. 3-5-4, the second at Rs. 4-10-8 per acre. The former was more liberally manured and better cultivated than the latter. The respective outturns are:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 12).	18	458	2,357	16 6 5	3 5 4	26·87
Second do. (Exp. No. 13).	8	185	1,363	7 3 3	4 10 8	64·79

Bájri grown alone was also tested. The seed rate, 19 lbs. per acre, is twice what it should be. This field also has *goráda* soil and bears an assessment of Rs. 6-0-9 per acre, which appears high. Tobacco is occasionally taken but *bájri* is mostly grown. The field was fairly manured. Season and tillage are each described as

good. The crop is estimated at the average standard, and yielded per acre 621 lbs. grain and 2,454 lbs. of useful by-product. The gross acre outturn is valued at Rs. 20-12-6. The incidence of assessment, 29·09 per cent., is decidedly high.

Panch Mahals.

Mr. Maconochie, Assistant Collector, was asked to conduct two or three experiments on *bájri* followed by wheat. He tested *bájri* but could not do the wheat tests owing to his transfer. His successor arrived too late in the district to do any. Mr. Prânlál, who was directed to make three experiments on *rági* and two on sesamum, did 4 on the former and 3 on the latter.

The Assistant Superintendent, Gujarát Revenue Survey, working in this district, was also asked to take tests in *juvár*, rice and wheat. But owing to (1) pressure of work, (2) exigencies of tour, and (3) illness, he could not carry out any.

Mr. E. Maconochie, Assistant Collector.

This officer tested two *bájri* fields. This cereal is always a mixed crop in the Panch Mahals. The subordinate pulses were sown mixed with the *bájri* and occupied the same rows. The pulses were not tested and the *bájri* outturn is an indefinite proportion of the whole yield of each field. The reported seed rates are high. The crops were sown at the end of July, the first field being sown a second time at this date owing to the first sowing having been washed out by heavy rain. The fields have each poor *gorádu* soil. The first field is assessed at Re. 0-15-2 and the second at Re. 1-1-9 per acre. The former was lightly manured, while the latter was unmanured this year. The first field grows *bájri* and *bávto* in alternate years; the other grows *bájri*, *bávto*, *banti*, &c., but no definite rotation is practised. The cultivator of the first is not an agriculturist by caste; the occupant of the other is a minor; the cultivation of each suffered accordingly. The crops ripened at the end of October and gave the following results:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 15) ...	10	538	1,972	18 8 6	0 15 2	5·11
Second do. (Exp. No. 16) ...	10	277	1,228	10 2 10	1 1 9	10·90

The subordinate crops were fair, and it may be accepted that the burden of assessment is light. The effect of manuring the first field is well shown in the lower incidence.

Mr. Prânlál Harkisandás, District Deputy Collector,

Submits 4 tests on *bávto*, and 3 on sesamum. In the eastern Mahals the cultivation of *bávto* is apparently limited to small portions of holdings. The crops experimented upon occupied in each case small areas. The assessment of the first field, Re. 0-12-5 per acre, indicates that the field either by position or otherwise is inferior to the other fields, which respectively are assessed at Re. 1-12-9, Re. 1-2-11 and Re. 1-5-9 per acre. The first field grows only rain crops. The experimenter believes that the others are capable of producing second crops every year. The reported rotation, however, shows that only the field bearing the highest assessment has grown second crops during the last three years. This is a significant indication that the comparative values of the fields have been adequately gauged by the classer. All the fields have *gorádu* soil. The previous cropping of each field is tabulated below:—

	1890-91.	1891-92.	1892-93.	1893-94.
First field	Waste ...	Kodra ...	Niger seed ...	Bávto.
Second do.	1 Maize ... / 2 Gram ...	1 Maize ... / 2 Gram ...	1 Maize ... / 2 Gram ...	Bávto.
Third do.	Udid (black gram.)	Mug (green gram).	Gram ...	Bávto.
Fourth do.	Sesamum ...	Udid (black gram).	Gram and Udid (each half the field).	Bávto.

The greater portions of the third and the fourth fields were under pulse crops again this year. This probably indicates a scant manure supply, because on land in poor condition pulses will undoubtedly yield better than cereals or oil-seeds. The second and third fields were lightly manured for the *bávto*. The others were not manured. The cultivation of the first field is described as bad, that of the other fields good. Each of the crops were grown from transplanted seedlings. The respective seed rates and area of seed-bed to acre of transplantation are as under :—

	Seed rate per Acre.	Seed-bed for an Acre.
	Lbs. tolas.	Gunthas.
First field	4 37	$1\frac{7}{33}$
Second do.	6 32	$1\frac{2}{3}$
Third do.	6 16	$1\frac{1}{16}$
Fourth do.	5 37	$1\frac{11}{24}$

The seedlings were planted out in the first or second week in August, and the crops were ripe in the second week of November. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 17)...	8	451	1,715	7 6 7	0 12 5	10·47
Second do. (Exp. No. 18)...	14	1,050	2,823	16 15 0	1 12 9	10·60
Third do. (Exp. No. 19)...	17	1,272	2,954	20 1 4	1 2 11	5·88
Fourth do. (Exp. No. 20)...	12	919	2,539	15 1 0	1 5 9	9·02

The grain as well as the straw are valued at exceptionally low rates even for an outlying district. The grain is priced at $70\frac{1}{2}$ lbs. per rupee. The by-product varies from $11\frac{2}{7}$ cwts. per rupee in the fourth test to $15\frac{2}{7}$ cwts. per rupee in the first. If the cultivation had been more liberal the value of outturn would have been in each case considerably enhanced, and there are good grounds to believe that the burden of assessment is not heavy.

This officer's sesamum tests give results which are by no means satisfactory. In each case the percentage incidence of assessment works out very high, and for this reason, if for no other, the details of the report should have been less

sketchy. I am unable to draw definite conclusions from the reported information; but the unfavourable results reported should warrant in future years the testing of crops grown on similarly classed and similarly cultivated lands. The cultivation is described as indifferent, and the season as not favourable. Two of the fields had been waste for the three previous years. In the third field this year's crop was the second sesamum crop taken after two years' fallow. The seed for each crop was broadcasted in August. This would have necessitated a higher seed rate than if the crops had been drilled. *Til* seed is so small that it is mixed with ashes, dust, or dry powdered cowdung before sowing in order to secure even distribution. It is not at all likely that more than perhaps $\frac{1}{10}$ of the reported quantities could have been sown; and of sound seed even less than that proportion would have sufficed. The outturn, &c., figures are as under:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 21) ...	8	107	353	5 12 6	1 7 5	25·31
Second do. (Exp. No. 22) ...	8	111	357	5 15 10	1 9 9	26·89
Third do. (Exp. No. 23) ...	8	131	382	7 0 5	1 4 5	18·16

Broach.

Experiments on *bájri*, rice and sesamum were arranged for in this district. Mr. Leggatt forwarded one test on each of these crops. Mr. Phirozsháh owing to an accident was prevented from experimenting on the last and substituted, with Collector's permission, wheat instead. His tests are worked out with unusual care and are well reported.

Mr. E. H. E. Leggatt, Assistant Collector.

This officer's report embodies the results of three crop-tests, one on rice, one on *bájri*, and the third on sesamum. Rice was sown alternately with a mixed row of cotton and *tur*. Only the rice was tested (No. 24). It might be said to occupy half the area of the field. Acre outturn, however, based on this calculation, would be extremely fallacious; because if the rice had not been sown at all, the rows of cotton and *tur* would have been no less wide. The season determines, in a great measure, which crop succeeds best. All the crops of a mixture may do well, but it is by no means uncommon to find one or more crops of a mixture comparative failures, and suppressed by the others which thrive better. In the field tested, the cotton and *tur* appear to have thriven at the expense of the rice. The experimenter writes that cotton would bear the chief burden of assessment. He also reports that the rice straw was very short, and, therefore, he puts no value upon it. The inference from the two statements is that the value of the yield of rice was a mere fraction of the value of the outturn from the field. If it were otherwise, the burden of assessment would be excessively heavy. Even if the whole mixed crop had been accurately tested, I doubt very much if the percentage incidence of assessment would have worked out to a moderate figure. The field is reported to be fallowed once in four years. A fallow field is known as a *vásel* field in Broach. The practice of fallowing is common, and is adopted by the best cultivators, who recognise in it a means of keeping the land clean and of economizing manure. A *vásel* field is not a waste field. It is continually undergoing tillage, during the rains and throughout the fair season. The field tested bears an assessment of Rs. 19-8-0 per acre. The rice outturn was worth Rs. 10-2-11.

The *bájri* which was experimented upon (No. 25) had, subordinate to it, *tur*, *mug* and *chola*. The experimenter reports that the *bájri* was thickly mixed with the other crops. The *bájri* only was tested. The field has black soil assessed at Rs. 11-3-1 per acre. It grows *juvár* and *bájri* in alternate years, the former apparently alone. The *bájri* outturn is reported worth Rs. 12-5-6 per acre or Re. 1-2-5 more than the assessment. The value of the pulse outturn is unknown, and it is useless attempting to gauge the fairness of the assessment from the figures reported.

The third test (No. 26) on *til* furnishes more reliable data. The field has black soil assessed at Rs. 7-2-3 per acre. It grows cotton every second year, and in rotation with it *til* and wheat. In Broach cotton is undoubtedly the rent-paying crop on dry-crop land. The season for sesamum was fair. The cultivation is described as good. No manure was applied. The crop was drilled seasonably in August and ripened in January. The period of growth indicates that there was no lack of moisture in the field. *Til* is, however, a delicate crop, easily damaged by cloudy weather and by other causes. The seed rate, 30 tolas per acre, would have been sufficient only if the seed was quite sound and very carefully sown. An outturn of 155 lbs. per acre classes the crop in local opinion as an average one. The gross value of outturn is Rs. 14-8-6. I think the anna valuation is too high. The percentage incidence works out 49·14. This is exceedingly and probably exceptionally high. I believe, however, that on all average dry-crops, except cotton, grown on the best black soil fields of Broach, the assessment is seldom less, and is often more than $\frac{1}{5}$th of the gross outturn.

Mr. Phirozshâh Pestanji, District Deputy Collector,

Submits three tests which were well conducted and fully reported. The experimenter has exercised much more than average discrimination in reporting details which are exceedingly valuable. The first experiment (No. 27) was taken on rice, which is an important crop of the village occupying 160 acres out of a total of 400 acres under cultivation. In the village (Chorási, Anklesvar táluka), the cultivation of this cereal is extending because the facilities for irrigation are ample, and rice pays better than cotton. A large creek, which is tortuous and shallow, constantly overflows during the monsoon and supplies the water necessary for irrigation. The crop selected was no better than the other crops of the village. The experimenter reports that he could not find an indifferently cultivated field and gives a very pertinent reason. He says nothing but careful and laborious cultivation would pay on the highly assessed *kiári* lands. Mr. Phirozshâh reports that the Chorási cultivators are skilful and industrious, and that the cultivators of rice in the village have a decided advantage in obtaining an ample supply of irrigation water. Elsewhere tanks afford facilities for irrigation; but he reports these to have silted up everywhere and the water supply from these is now insufficient.

The field experimented upon is owned by a Pátidár who is well-to-do, owns three pairs of bullocks, and cultivates in all about 25 acres. The tested field bears an assessment of Rs. 11-4-0 per acre for soil and water combined. The soil is rich black of great depth, and equal to the finest cotton soil of the district. The season was favourable. The rainfall was above average and was well distributed early in the season. The late rains were however scant, and the field was so hard when the rice was reaped that it could not be ploughed for a second crop. The after-crop is usually *láng*, and it has been grown in two of the last three years. In 1891-92 the early rainfall was deficient and cotton replaced rice. The field was well tilled, carefully weeded, and liberally manured. The crop was grown from transplanted seedlings, the seed being sown in May-June and the seedlings planted out in July. The seed-bed was manured at the rate of 32 cart-loads cattle manure per acre, whilst the field had an application of 19 loads per acre. The cultivator owns two milch buffaloes in addition to his work cattle; but the home produced manure is found quite inadequate for the holding. This year the manure applied to the rice field was bought at 8 annas a cart-load, a very moderate rate, considering the essential importance of manure in a heavily assessed district. A $6\frac{1}{4}$-guntha seed-bed supplied seedlings sufficient for an acre of transplantation. The seed sown on this area of seed-bed was $57\frac{1}{2}$ lbs. This is a high rate. The crop ripened on the 31st of October, and the outturn, &c., results are as under:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 27.	18	2,664	3,230	62 2 5	11 4 0	18·10

The rice straw is perhaps under-valued at 1,230 lbs. per rupee. Still that may be all that it is worth, because *juvár kadbi* and other fodders more suitable for cattle than rice straw are never scant or very dear in Broach.

Bájri was tested (No. 28) in a good black soil field assessed at Rs. 8-13-4 per acre. The field is commanded by a well and grows valuable garden crops such as sugarcane, garlic, onions, coriander, fenugreek, &c. It is essential to the successful cultivation of irrigated garden crops, grown on black land that the land be rested periodically from irrigation, and it is common to have a portion of the garden land annually under dry-crop and a portion under irrigation, alternating the portions thus treated every year. The dry-crop is valuable in affording fodder for the extra number of work cattle, which must necessarily be kept for raising water and for the specially careful tillage of garden land. It is not the dry but the irrigated crops which bring in the greater portion of the revenue. Under the circumstances it is satisfactory to find that *bájri* yielded so well as it did in the field tested. The cultivator was, through illness, unable to watch the crop carefully and it suffered from birds. No manure was applied. It is not likely, however, that that influenced the outturn, as the previous irrigated crops must have been heavily manured, and a fair residue would have remained in the soil. The season was favourable and the tillage good. The seed rate, 3 lbs. per acre, is an under-estimate, I think. The crop sown in June ripened at the end of October and gave the following outturn, &c., results :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 28.	14	800	1,750	27 14 1	8 13 4	31·68

The *bájri kadbi* is under-valued at 1,640 lbs. per rupee. The burden of assessment is not high considering the conditions under which the crop was grown. And there is direct evidence that the garden cultivation is profitable in the fact that although the Government assessment is Rs. 8-13-4 per acre, a tenant has been found willing to pay Rs. 20-4-2 per acre for the field. The tenant has had the field for many years, and has no intention of giving it up.

Mr. Phirozsháh's third test (No. 29) on wheat brings out facts of interest. The field selected is ordinary dry-crop cotton soil assessed at Rs. 4-0-5 per acre. The soil is inferior to the rich deep cotton soil found further away from the coast. The village is a Koli village, and the experimenter hazards the remark that Kolis, at least in the Broach district, are as careful and industrious cultivators as Kunbis. The field was remarkably clean and bore evidence of very careful tillage. It was manured for the wheat, about 14 cart-loads per acre being applied. The occupant owns other fields which lie further away from the village. These are seldom manured, because the cost of carting so far is considerable, and the available supply is required for land nearer home. The manure applied to the wheat field was the whole home supply of the year. There is nothing unusual in applying a heavy dressing of manure to the crop rotated with cotton, because cotton benefits less from manure

applied directly than from manure applied to the previous crop. The season was not altogether satisfactory. The late rains were deficient. Wheat, however, in common with rabi *juvár* and *láng*, suffered less than cotton, which in Broach is, more or less, a crop of the rabi season. The wheat was drilled in November and ripened on the 20th of February. The period of growth is rather short and indicates that the crop was perhaps hastened to maturity by lack of moisture in the soil. The seed was drilled with a two-coulter drill. The reported seed rate, 60 lbs. per acre, is somewhat higher than usual. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 29 ...	16	844	1,056	340 1 0	4 0 5	11·81

I attach very great importance to the tests on rice and wheat by this officer; because the results obtained are, for an ordinary season, not very far from the average of the better cultivated fields. Throughout the greater part of Broach there is evidence that where the cultivation is liberal the burden of assessment is by no means heavy, but at the same time I can say from personal observation last year that for one liberally cultivated dry-crop field there are four that are not so cultivated; and that owing to the fact that fields situated at a distance from the village are seldom manured, the crops in these were such that the burden of assessment must have been necessarily heavy.

Surat.

Subdivisional officers in this district were directed to conduct three experiments on rice and, time permitting, one or two tests on cold weather crops of sugarcane and gram. Mr. Doderet has submitted three rice tests and also one on sugarcane. Mr. Wood was attached to a Survey Party and was also in charge of a division, and having much to do was unable to conduct any experiments. Mr. Kotvál has sent the required number of tests on rice.

Mr. Mollison, Superintendent of Farms, took a test on indigenous potatoes in this district.

Mr. Forbes, Assistant Superintendent, Gujarát Revenue Survey, who was working in this district, was called upon to test *vál*, sugarcane, cotton and *juvár*. He made an experiment on mixed *juvár* which, for reasons given further on, has been rejected, and owing to transfer he was unable to carry out any other experiments.

Mr. W. Doderet, Assistant Collector,

Sends three carefully reported rice tests and a fourth one on sugarcane. The rice tests (Nos. 30—32) were taken at Bulsár. The selected fields grew an inferior variety called *Kada*, which is the common rice crop of the táluka and forms the staple food-grain of the poorer classes. The rice crop of the first two fields is dependant on rain-fall. A second crop of *láng* is taken annually on the first and is helped by water drained from an adjoining marsh. The second field grows a second crop of *vál* when the late rains are favourable. The third field is under a tank, which can be depended upon to give sufficient water for the rice and for a second crop of *vál* also. This year the rain in September was deficient, with the result that the yields of rice from the first and second fields were slightly diminished, and with the further result that no second crop was taken this year in the latter, because the soil was too dry for ploughing and sowing after the rice was harvested. The owners of the first and third fields are

Bhátela Bráhmans, who are described as clever cultivators. A Dhed woman rents the second field. The experimenter reports that the tenant pays the superior holder Rs. 20 per acre, and also pays the Government assessment. The Collector, however, says that the statement is made under a misapprehension. Rice land, he says, is sublet in Bulsár at Rs. 20 to 22 per acre, but the landlord pays the assessment. The fields tested are assessed at the following rates :—

	Rs.	a.	p.	
First field	14	3	5	per acre.
Second do.	9	9	11	do.
Third do.	23	0	9	do.

The experimenter says that his tests bring out an important fact, *viz.*, "that at the original survey the facilities for obtaining water for the second crop, when the rainfall is deficient, have not in every case been uniformly valued in fixing the assessment; *vide* the inequality of the assessment in the case of the experiments Nos. 1, 2 and 3, which is not sufficiently accounted for by the poorer quality of the land in the case of No. 1." It is not clear how Mr. Doderet arrives at his conclusion. This year, with a rainfall timely and ample up to September, the outturns from the fields show that the burden of assessment is lightest on the field bearing the least assessment, and heaviest on the field bearing the highest assessment. It can only be conjectured how far this would be altered if the values of the second crops got from the first field and the third field were added to the values of the rain crops of these fields. It is certain, however, that thereby the incidence would, in each case, be considerably reduced. I take it that the second field bears a less assessment than the first, because the position of the former is such that it does not benefit to the same extent as the latter by ordinary rainfall. The first field lies under a marsh, and although the cultivator does not take water for the rice from the marsh, the position of the field is such that its soil must be kept continuously moist by the natural drainage of the marsh water. In a year of deficient rainfall this field would have a marked advantage over the second, and the third would have a considerable advantage over both. It is clear that there should be, on account of water advantages, a considerable difference in the assessment exigible from each field. Any small difference between fields in the quality of the soil is of minor importance. If tests had been taken on the same fields in a year of unfavourable rainfall, the outturns would, I think, vary in direct relation to the assessments. But Bulsár is not liable to have a deficient rainfall, and on the off chance of that calamity it would not be unwise to conclude that the fields are each fairly assessed.

The crops of each field were grown from transplanted seedlings. It is explained that the seed rate for the first field is high owing to the inferior quality of the land. The seed rate of each field is high.

The respective seed rates and the areas of seed-bed to acre of transplantation for each field are noted below :—

	Seed-bed for acre of transplantation.	Seed sown for acre of transplantation.
	Gunthas.	Lbs.
First field	$3\frac{1}{3}$	229
Second do.	$7\frac{2}{5}$	181
Third do.	6	153

Each field has black soil. The tillage of each is described as good. The first field was manured with 30 cart-loads per acre of cattle manure, the second with 26 cart-loads and the third with 80 cart-loads per acre. The owner of the last field explained that he had a number of cattle and an ample supply of manure. The crops all ripened in the middle of October. The outturn, &c., figures are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 30) ...	15	2,094	2,531	51 3 10	14 3 5	27·74
Second do. (Exp. No. 31) ...	18	2,698	3,773	63 1 3	9 9 11	15·25
Third do. (Exp. No. 32) ...	20	2,629	3,553	57 14 4	23 0 9	39·80

The grain, although of the same variety, is valued for the first, second and third fields, respectively, at lbs. 43, 45 and 48 per rupee. These differences are attributable to variations in quality.

This officer tested sugarcane (Exp. No. 33) which occupied 1 acre of a number the extent of which is 3 acres 22 gunthas. The field is irrigable from a well, and bears an assessment of Rs. 55-10-0 for soil and water combined. The field has been sublet for 15 years, by the superior holder (a Bráhman) to a Kunbi. The nett annual profit to the Bráhman by the transaction is Rs. 51-9-5 or Rs. 14-8-6 per acre. The Government assessment is Rs. 15-10-8 per acre. But being personal *inám*, the owner pays Government only Rs. 6-15-0 as *salámi* for the whole number and Rs. 3-7-7 as Local Cess. The field in the previous year grew rice with a second crop of *vál* and castor. The soil is crumbling black which is suitable for irrigation and the rent paid by the Kunbi indicates that he intends to grow sugarcane and other garden crops. Under no other system of cultivation could he possibly expect to make a living, and pay the rent, which, inclusive of local rates, &c., is about Rs. 18 per acre. The Kunbi is reported to have sublet the acre under cane to a Koli for Rs. 60 in December 1892. This portion of the number was manured in June 1892 with 40 loads per acre, farm yard manure. Probably also the field was ploughed during the monsoon by the Kunbi. Otherwise the Koli could not have got the field ready for sugarcane as expeditiously as he did. In this manner the very high rent is probably accounted for. The Koli took possession and planted the cane in December. The cultivation was indifferent in this sense that the crop was not sufficiently watered after planting, and the sets germinated so irregularly that a second planting was required to fill up vacancies. *Malbári* canes were planted in the first instance with a plough. 2,700 whole canes were planted per acre, equivalent to 21,600 sets. The whole canes are passed through a tube in the plough and are left deeply imbedded in the furrows. "Owing, however, to the inequality of the canes, much labour is entailed, and the operation brought to a stand-still when the canes stick." The *Vansi* sets were planted in January 1893, and were trodden down with the foot in the soft mud in the usual way, the field having been previously flooded to make the soil soft. The resulting crop was a mixed crop. The tillage was sufficient; the crop was carefully weeded and watered during the fair season twice a month. The early rains were favourable, but the late rains scant. The crop does not appear to have been irrigated during breaks in the rains, nor after the rains upto December. This information must, I think, be erroneous. The *Malbári* and *Vánsi* varieties were respectively 12 and 11 months growing. The former is a soft cane of the Mauritius kind. The *Vánsi* canes were thin and small as compared with the *Malbári*. The following tabulated figures compare the two :—

	Malbári.	Vánsi.
	Lbs.	Lbs.
Average weight of each topped cane ...	4·2	1·5
Percentage of gul to cane	11·3	6·5

The following figures in conjunction with those of the foregoing table indicate that if the whole field had been under *Malbári* cane the outturn results would have been much better. The following outturn is from $\frac{1}{10}$th acre:—

Varieties.	Number of canes topped.	Weight of canes topped and stripped.
		Lbs.
Vánsi	3,112	4,653
Malbári	612	2,587

A three-roller mill was used for expressing the juice, 6 pairs of bullocks, in relays of two pairs at a time, being required to work it. The *gul* was made in the ordinary manner. The crushed cane was found sufficient as fuel. The dry stripped leaves are sold for thatching, whilst the green tops are fed to the cattle working the mill, or are saleable at about one anna a bundle of 40 lbs. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn per Acre.			Value of Outturn, exclusive of green tops fed to cattle.	Assessment per Acre.	Percentage incidence of Assessment.
		Gul.	Tops.	Dry leaves.			
	As.	Lbs.	Lbs.	Bundles.	Rs. a. p.	Rs. a. p.	
Experiment No. 33.	17	5,712	080	1,400	268 4 0	15 10 8	5·83

I think the crop is over-estimated at 17 annas. The experimenter estimates the cost of cultivation, and, notwithstanding the high rent paid, works out a profit to the Koli of Rs. 43-11-0 on the acre of sugarcane.

Mr. Anna Gopál Kotvál, District Deputy Collector,

Submits three rice tests (Nos. 34—36). All the crops yielded well, two of them particularly so. Each crop is estimated at the maximum anna valuation. The season was favourable. Each field was well cultivated and liberally manured, the first with castor cake, the others with ordinary manure. The outturn results go to prove that, although the assessment on rice lands in the Surat district appears high, there is a liberal margin of profit to those cultivators who farm well. Each field has black soil and the respective assessments are Rs. 8-5-5, Rs. 14-8-6 and Rs. 11-12-4 per acre. Fields in the 1st and 3rd tests are dependent on rain water only. They must be favourably placed at a lower level than surrounding fields, because they grow second crops of *vál* and castor mixed every year. The second field is under a tank. It grows no second crop. This year's crop was irrigated 7 times from the tank. The field bears a higher assessment than the other fields, presumably on account of tank assistance. Each field grew a different variety of rice, that of the second field being the most inferior. The crops were grown from transplanted seedlings. The seed rate per acre and area of seed-bed to acre of transplantation are shown below:—

	Area of Seed-bed to acre of transplantation.	Seed sown in seed-bed for one acre of transplantation.
	Gunthas.	Lbs.
First field	4	76
Second do.	4·8	68
Third do.	3·6	67

The seed rates are I think high, still they are much nearer average than those reported above by Mr. Doderet. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 34) ...	20	2,392	3,100	57 2 5	8 5 5	14·59
Second do. (Exp. No. 35) ...	20	3,586	4,850	79 1 8	14 8 6	18·37
Third do. (Exp. No. 36) ...	20	3,144	6,190	77 4 7	11 12 4	15·23

The tank-assisted field appears to bear a heavier burden of assessment than the others. But if the rainfall had not been timely or if it had been deficient it would doubtless have shown its superiority. On the other hand, the incidence on the other fields would be considerably reduced, if the value of the second crop be added to that on the rain crop.

Mr. J. W. Mollison, Superintendent of Farms,

Submits a test (No. 37) on potatoes. The experiment was made with the object of gauging the fairness of the burden of assessment on garden land in the vicinity of Surat. Garden cultivation is very extensive in the district and is materially helped by an ample supply of manure which is obtainable at a moderate cost from the Surat Municipality. The manure is partially decomposed compost made up of nightsoil, sweepings and rubbish, and there was evidence that for garden crops it proved an active and powerful manure. That was the conclusion arrived at from a minute inspection of the garden land of the villages near Surat. The manure is carted as far as 8 miles. The experimenter is of opinion, having last year studied the cultivation of the district, that the burden of assessment is light on land suitable for irrigated garden crops, with sweet well water, also upon all good *bhata* land. It is moderate on rice land with good water facilities either from position or otherwise. But it is distinctly heavy on purely dry-crop black soil and more particularly on outlying fields situate so far from the villages that manure is seldom or never applied. The following account is taken from his report :—

"The field selected for experiment is a fair average of the rich garden land of the Kumbhárya village. It, like the other garden fields of the village, is in a high state of cultivation, and produces magnificent crops in rapid succession. Throughout this garden tract the well water is perfectly sweet and is found at a moderate depth (about 30 feet). The ordinary garden crops grown are: sugarcane, onions, garlic, cabbages, sweet-potatoes, ginger, turmeric, brinjals, ground-nut and potatoes. Potatoes for planting were formerly either of local production or were obtained from Poona. Owing to the importation from Poona, disease was introduced into the district. Within the last 3 or 4 years Italian seed potatoes bought in Bombay have been extensively grown and have succeeded well. But unlike the local variety these Italian potatoes or any other imported kind will not keep long enough to be used as seed in the following season. Consequently fresh imports are required each year. In the villages round Surat there is only one season for planting potatoes, namely, the cold season. It is impossible to grow them in the monsoon owing to the heavy downpours of rain. The crop tested showed no signs of disease. The cultivators affirm that the local (*tarabdi*) variety is much less liable to disease than imported seed. The *tarabdi* tubers though numerous, 20 to 30 to a stem, are exceedingly small—very few exceed the size of a walnut and they are mostly about the size of a bean. Large and small mixed as lifted were worth Rs. 15 per Khandi of 21 maunds at date of experiment. This is equivalent to 53 lbs. per rupee. In the local market the smallness of size does not depreciate values in comparison with exotic sorts so much as it ought to do. If the demand was purely local this could be understood; but potatoes are largely exported from Surat to Bombay, where the price of large potatoes is much higher than that of small. One reason why the larger exotic varieties do not command a higher price is that they do not keep well when stored and consequently they are forced on the market.

"I was unable to find a field of exotic potatoes in the Kumbhárya village in a fit condition for harvesting at the time when I tested the local variety. But being anxious to have some data to enable me to compare the respective yields, I had the produce lifted from 12

square yards of a field growing Italian potatoes. The crop was ripe but being recently irrigated the soil was not quite dry, and it would not have been fair to the owner of the field to have taken a regular test. Potatoes lifted wet will not keep. I had two beds only dug up. But the beds are formed with such exactness and the crop was so regular throughout, that I am quite satisfied that the outturn from the two beds approximately shows that from the field. Manure was applied directly for this crop and the cultivation was as good as it could be. There was no trace of disease. The tubers were large, 4 to 5 at a stem, and were worth Rs 20 per Khandi. I think the crop may safely be estimated at 18 annas. The field is *inám* land and bears no water rate. Consequently in tabulating the results for each field below, I show only the soil assessment of each :—

	Anna Estimate.	Outturn per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
Indigenous potatoes	15	7,513	141 6 3	9 1 0	6·40
Italian potatoes	18	15,327	384 1 9	8 13 0	2·29

"I could not accept as accurate all the figures given by the cultivator as to cost of cultivation of the local variety, and in the following estimate have changed figures which were obviously incorrect. Home labour could not be distinguished from hired labour. In the immediate neighbourhood of Surat, labourers are paid 5 annas a day and women 3 annas. Labour is cheaper in villages 8 or 10 miles distant from Surat, but not much at busy seasons. The rates charged below are fair rates :—

Area of plot 26·97 *gunthas.*

	Rs.	a.	p.
Ploughing 6 times ; 1 man and 1 pair of bullocks, 1 day each time at 14 annas	5	4	0
Clod crushing ; 2 men, 1 day	0	8	0
Making beds ; 4 men, 1 day	1	0	0
Digging pits for sets ; 4 men, 1 day...	1	0	0
Planting and covering sets ; cultivator said, 12 women, 1 day a fairer estimate would be 5 women, 1 day ...	0	10	0
Price of seed, 14 maunds at Rs. 2½ per maund ; (potatoes dear at planting time, small whole potatoes planted) ...	31	8	0
Field hand-weeded ; 7 women, 1 day	0	14	0
Surface of soil loosened with Khurpa	0	14	0
9 waterings ; 4 bullocks and 2 men ; one watering took a day ; at Re. 1-12-0 each	15	12	0
Harvesting crop, cartage, &c.	8	2	0
Total ...	65	8	0
Per Acre ...	97	2	4
Add assessment and water rate per Acre ...	17	8	0
Grand Total ...	114	10	4
Value of Outturn per Acre ...	141	6	3
Profit per Acre ...	26	11	11

The residue of manure left from the previous crop would have benefited the potatoes. I have taken no count of this. It is however almost certain that most of the labour was home labour or was paid for on the usual "give and take" system, and the owner not only got a fair rate of wage for the members of his household but a fair margin of profit besides."

Mr. H. D. E. Forbes, Assistant Superintendent, Gujarát Revenue Survey,

Submits a test on *juvár* which had, subordinate to it, *tur* and green gram. Each crop was tested. The experimenter reports that *juvár* was mostly harvested during the Christmas holidays. He asked the Mámlatdár to keep some crops uncut until after the holidays. When Mr. Forbes' camp arrived at the village, only 2 fields remained uncut, and on hearsay evidence he reports the crop selected for experiment to have been 12 to 13 annas as compared with other crops of the village, which are reported to have varied from 8 to 18 annas. The *juvár*, the *tur* and the *mug* were all tested on the same day. It is impossible that each could have ripened at the same time. If the *juvár* was just ripe the *tur* must have been under-ripe; whereas if the *juvár* was over-ripe, which is probable, the cultivator must have been put to considerable cost in watching

the crop, or birds must have done considerable damage. The field bears an assessment of Rs. 5-5-10 per acre and the gross value of outturn per acre works out Rs. 29-5-2, of which nearly Rs. 12 is the valuation put on the *juvár kadbi*. This valuation is decidedly high. The crops of the Surat district were generally full average ones, and I fear Mr. Forbes' test was taken on a crop considerably under average for the district. For this, and for other reasons referred to above, the experiment is not reported.

Tha'na.

Experiments on sugarcane, gram and sesamum were prescribed for this district. Mr. Deshmukh submitted a test on *rági* and two on gram. Mr. Pratt made no experiments and his successor forwarded only one test on gram. Mr. Patvardhan, District Deputy Collector, has sent two tests on gram and one on sugarcane which are well reported.

Mr. L. G. Deshmukh, Assistant Collector,

Reports one test on *nágli* and two on gram. The *nágli* crops of the district were more or less failures, being considerably under average, owing to the excessive rain early in the season and insufficient rain afterwards. The deficiency of outturn was locally estimated at ½ to ⅔ of the normal yield. Although the crop experimented upon is valued at half the maximum standard, the experimenter's notes show that the outturn bears a higher anna estimate than it ought. The yield is apparently about ⅓ of a full crop in an average year. The crop, as usual, was raised from transplanted seedlings. In the previous year *udid* was grown after two years' fallow. No manure was given this year and the cultivation is described as indifferent. The field bears an assessment of Re. 0-3-1 per acre. It is reported that ⅓ acre seed-bed was required for an acre of transplantation. If such was the case, the seed-bed was unnecessarily large. The information is probably wrong, as it is reported that only 3 lbs. of seed was broadcasted on ⅓ acre. A seed-bed of that size should have required perhaps 4 times the reported quantity of seed. The by-product was not valued. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn of grain per Acre.	Value of Produce.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 38 ...	10	351	7 4 0	0 3 1	2·65

This officer's gram tests (Nos. 39 and 40) were taken on fields of very different characters. One crop was grown on land assessed at Re. 0-3-4 per acre, which grows gram annually as the sole crop of the year. The other crop was a second crop after rice on good land assessed at Rs. 4-2-6 per acre. The field has grown gram as a second crop in two of the last three years. A second crop is taken after the rice, apparently as often as the season proves favourable. The *rabi* field is bunded and water is held in it during the monsoon. Subsequently the grass is cut and the field ploughed for gram. No manure was given. The seed rates, 48 and 44 lbs. per acre, are about average. The by-products were not valued. The season for each field was favourable. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn of pulse per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 39) ...	20	564	15 8 0	0 3 4	1·34
Second do. (Exp. No. 40) ...	16	391	10 12 0	4 2 6	38·73

The incidence in the second field is fair for a second crop.

Mr. C. W. M. Hudson, Assistant Collector.

This officer reports one test (No. 41) on gram which yielded exceptionally well. The soil is described as ordinary rice land retentive of moisture and therefore capable of yielding a second crop. Gram was grown this year as well as last after rice. The assessment, Re. 1-9-3 per acre, is apparently very low. Late rains were scant, but the gram was not affected by this circumstance, as the soil held a good deal of moisture, when the rice was reaped. The land was once ploughed and then the seed was broadcasted, 56 lbs. per acre being the seed rate. A second cross ploughing covered the seed. The crop was three months growing. The plants were nipped or pruned at a very early stage in order to encourage branching and the formation of more flowers and fruit. No further attention was given or required. The chaff (*bhusa*) is admitted to be a useful fodder for cattle but was not valued. An outturn of 867 lbs. of pulse per acre, worth Rs. 31-14-6, classes the crop at 12 annas according to local opinion. I think the crop might fairly bear the maximum anna valuation. The incidence works out 4·94 per cent. which for a second crop is a very moderate figure.

Mr. V. R. Patvardhan, District Deputy Collector,

Sends two tests on gram and one on sugarcane. The reports are carefully drawn up and give full information on all points of interest. The outturn of gram from the first field tested is satisfactory, that from the second field is unusually high.

The first field is classed as kharif, but owing to its low-lying position, holds too much water even for rice and only grows rabi crops. Gram is taken every year. The soil is medium black and bears an assessment of Rs. 2-10-8 per acre. The second field has dark brown soil assessed at Rs. 3-3-11. It grows rice every year. The gram followed rice this year, but no second crop had been taken during the 7 previous years. The field is fenced and on this fact depends the possibility of taking second crops. In unfenced fields of the village, even in favourable seasons, second crops are not taken because the village cattle stray at random over the fields after the rice is harvested. In contrasting the results from each field it is to be noted that the season was not alike favourable to each crop. Rain fell in December. The crop in the first field was at the time in bloom, therefore it was slightly damaged. The crop in the other field appears not to have been in flower at the time, therefore the December rain was beneficial. The seed in each case was broadcasted and ploughed in. The experimenter explains that the high seed rates, respectively 86 and 88 lbs. per acre, are due to the fact that the plough did not properly cover the seed and probably not more than ½ of the quantity sown germinated. The seed rates are exactly the same as those reported for gram crops last year by the same officer. No manure was applied to the first field, and in the second none was given either for the rice or the gram. The cultivation in other respects was good. The by-products of each field were neither weighed nor valued. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn of pulse per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs.	Rs. a. p.	
First field (Exp. No. 42)	16	775	27	2 10 8	9·87
Second do. (Exp. No. 43)	20	1,152	39	3 3 11	8·32

The incidence in the second field, for a second crop, is exceedingly light. The first field is bunded. The area is 2 acres 2 gunthas. If an outlet can be provided for the water which stagnates during the monsoon, the field is unquestionably capable of growing rice, and if artificially drained would, owing to its low-lying position, probably grow second crops every year.

This officer's report on the sugarcane test (No. 44) affords information of interest and value. The cultivation of sugarcane and other garden crops is very extensive along a belt of sandy soil which fringes the Máhim coast. Sugarcane is not grown so much for *gul*-making as for raw eating. The canes are largely exported to Bombay. The village (Yedvan) in which the experiment was made is noted for the *gul* manufactured there. The soil of the selected field is more of a loam than that of the ordinary garden land of the district, which, on account of its sandy character, is often improved in consistence by a heavy application of clay soil carted from the rice fields which lie more inland. The whole of the Máhim garden land is watered from wells which are not deep and the water is so shallow that Persian wheels are the universal water-lifts. The sugarcane is a 10 or 11 months crop planted in May and made into *gul* during March or April. The field experimented upon grows rice during 2 years followed by sugarcane in the third. When the second rice crop was harvested the field was at once ploughed whilst there was yet sufficient moisture left in the soil. Subsequently it was ploughed 4 times during the fair season. The stubble was collected and the clods were crushed by hand and rolled by a plank after the first and second ploughings. No manure was applied before the sets were planted. Ridges 18″ apart were made and beds formed in May. The sets used each contained 3 or 4 joints or nodes and 22,800 of these were planted in the furrows per acre. The crop was watered at short intervals immediately after planting. Three days elapsed between the first and second watering. Five days between the second and the third and then 8 days between each afterwards. Five waterings were given before the rains. At this season the water in the well was very low and as the soil is of a porous character, and as the leakage from an ordinary channel in a sandy soil is considerable, the water was carried by means of vessels from the well to the crop. When the cane stood a foot high it was hand-weeded and castor cake applied. The powdered cake was placed round each root stock and the furrows were levelled up by soil carried from adjacent fields. This operation is apparently necessary to prevent the heavy rainfall of the district standing in the furrows and injuring the cane, which before the soil is added occupies the furrows. The crop was again hand-weeded in August, and a second top dressing of castor cake given. A third dressing of the cake was applied in September. The total quantity given in three applications was approximately 3 tons and 17 cwts. per acre, which at ordinary market rates must have cost Rs. 140 to Rs. 150. When the rains ceased the canes were earthed up, new beds and furrows being formed by the operation. This was necessary for the subsequent irrigation of the crop. About the same time the canes were trashed, wrapped and tied up, the object being to clear away all dead leaves, to protect the canes from damage by jackals, rats, &c., and to prevent the crop from lodging by storms of wind or of rain. No further attention, except watering every eighth day and careful watching, was required until the crop was harvested. The fully mature cane is separated at harvest time from the smaller immature shoots locally called *kheris*. The variety grown was a red black cane called *támbda ûs*. This and the other large soft varieties grown at Máhim were originally introduced from Mauritius. The crop tested is estimated at 16 annas. The yield per acre is as follows :—

	Number of canes per Acre.	Weight of canes per acre topped and stripped.
		Lbs.
Mature canes	25,560	57,989
Immature canes (Kheris) ...	9,300	4,451
Green tops	.....	8,055

The juice of the immature canes when boiled did not crystallize thoroughly. The product was molasses. Good *gul* was made from the mature canes. The *gul* was worth locally 14⅓ lbs. per rupee ; the molasses 23 lbs. per rupee.

The immature canes yielded apparently 24 per cent. of treacle ; whilst the mature canes gave the following results :—

Juice to cane...	...	...	70·5 per cent.
Gul to juice ...	...	...	20·6 „
Gul to cane ...	...	...	14·5 „

A small proportion of *nágli* flour was used to thicken the *gul* after boiling. These results compare very favourably with the best results of the Poona district, and this perhaps is the more remarkable as a wooden roller mill was used to express the juice.

Wood was used as fuel in boiling the juice. The crushed canes and dry leaves are used as ráb material. The green tops are sold as fodder. The mill is worked by buffaloes in relays, one pair at a time. The value of produce per acre works out as under ;—

Lbs.			Rs.	a.	p.
8,422 gul per acre	...	...	586	8	7
1,067 molasses per acre	...	...	46	5	11
8,055 green tops	...	...	13	5	0
	Total	...	646	3	6

The field is assessed at Rs. 4-7-9 per acre and the incidence of assessment works out 0·69 per cent.

CENTRAL DIVISION.

Kha'ndesh.

Two experiments on *bájri* and one each on wheat and sesamum were required from each officer in this district. The last crop was not tested as it was all cut before officers went into camp. Messrs. Cadell and Seddon tested linseed instead. Mr. Dodgson could not do the wheat tests as he proceeded on leave and his successor joined too late for that work. Both Messrs. Kázi Kamaruddin and Chitgubi represented that *bájri* and sesamum crops were all cut before they went into the district, and were allowed to take wheat tests instead. Only two experiments are submitted by each.

Mr. C. G. Dodgson, Assistant Collector,

Submits two *bájri* tests (Nos. 45 and 46). One crop is reported above average for the season, the other somewhat below average. Neither field yielded well. The early rains were heavy, but otherwise the season was favourable. Sowing was unnecessarily delayed until September as there was favourable sowing weather in July. Each field has light soil, and grows *bájri* continuously. The tested crops took less than three months to mature, and it is probable each was hastened prematurely to ripeness. No manure was applied to either field. The fields are, respectively, assessed at Re. 0-6-0 and Re. 0-7-4 per acre. The seed rates, 11 and 14 lbs. per acre, are probably about normal for light land in poor condition. The by-product is valued high. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 45) ...	7	140	250	4 1 6	6 0	9·16
Second do. (Exp. No. 46) ...	12	357	533	8 13 8	7 4	5·18

Mr. C. N. Seddon, Assistant Collector,

Submits a *bájri* test which is not satisfactory. The field selected has yellow soil assessed at Re. 0-9-5 per acre and is reported to grow cotton in rotation with *bájri*. The *bájri* had *math* subordinate to it, but the pulse was very poor and was not tested. The outturn figures indicate that the *bájri* also was more or less a failure. At any rate the yield was miserably poor. The seed was sown a month later than usual and the experimenter reports that there was no particular reason for this. The tillage was careless and no manure was applied. Mr. Seddon reports that had the field been well manured and well tilled, the yield would have been very greatly increased. The gross value of outturn per acre comes to Rs. 3-15-4. I cannot accept this as anything near average, because the season for *bájri* seasonably sown was distinctly favourable. The test is not reported.

Mr. Seddon also reports two wheat tests and one on linseed. One wheat field (Exp. No. 47) grew dry-crop and the other (Exp. No. 49) was irrigated and the results from each field may with advantage be compared. The dry-crop field has black cotton soil assessed at Rs. 2-10-8 per acre. It grows wheat, cotton and linseed, but no definite rotation is followed. The season for wheat was fair. The November rainfall was heavy, but there was little or no rain later. No manure was applied, and the cultivation is described as indifferent. The crop was drilled (75 lbs. seed per acre) in October and ripened at the end of January. The straw was very short, and its weight compared with that of the grain is so small that I almost doubt the accuracy of the figures. The grain in this as well as in the other wheat test by this officer is valued at a cheap rate.

The irrigated wheat grew on a number, which grew this year also cotton, castors, garlic, onions, sweet potatoes, tobacco, &c. The field has black soil and is irrigable from a well. The assessment is Rs. 4-9-10 per acre. The area under wheat was lightly manured in the previous year, but no manure was applied for this year's crop. The reported seed rate, 129 lbs. per acre, is high, but irrigated wheat requires more seed than dry-crop. The seed was drilled in October, and the crop ripened at the end of February. The crop, like a good deal of wheat grown in Khándesh, was not an irrigated crop in the true sense of the term; it was only irrigated when there was a decided lack of soil moisture. The field was flooded four times at intervals of a fortnight. If the crop had been watered at regular intervals during the whole period of growth, the occupant would have been almost compelled to have used a liberal application of manure. The by-product (*bhusa*) is valued at 35 lbs. per rupee, an extravagantly high rate. If the by-product in this case is valued at the same rate as the by-product of the dry-crop wheat, and there it is by no means low, the gross value of the irrigated crop would be reduced by Rs. 8-9-6 per acre. The outturn, &c., results from each field are noted below :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Dry-crop field (Exp. No. 47).	12	564	248	15 7 8	2 10 8	17·23
Irrigated do. (Exp. No. 49).	14	992	350	35 12 6	4 9 10	12·8

I do not think the results from the irrigated field are any better than could be obtained in a good season from a good dry-crop field under careful and liberal cultivation.

The linseed tested (No. 48) by this officer yielded fairly. The season was as good as the average season for this crop. The field selected for experiment has black soil and bears an assessment of Rs. 2-11-3 per acre. It grows wheat, cotton and linseed. No manure was applied. The cultivation is described as indifferent. The reported seed rate, 12½ lbs. per acre, is about the usual rate. An outturn of 377 lbs. per acre of oil-seed, valued at Rs. 19-12-0, is perhaps under-estimated at 10 annas. The incidence, in this case 13·68 per cent., is high in all Mr. Seddon's experiments. As regards the dry-crop tests the high incidence may fairly be attributed to the fact that the fields were selected for experiment, which had not been liberally cultivated, and the effects of poor farming become more noticeable in a season which is not altogether favourable. As regards the irrigated wheat the return, even if reduced on account of the high valuation of the by-product, is as good as the occupant could reasonably expect from an unmanured field.

Mr. P. R. Cadell, Assistant Collector,

Reports a test on linseed and another on wheat. The results are only fair. The season was more favourable for linseed than for wheat, the rainfall being deficient for the latter. Linseed on deep moisture-holding black land requires, during growth, very little rain if there is moisture sufficient for regular germination.

The linseed field (Exp. No. 50) is favourably situate near the town of Bhusával and for this reason needs no manure, at least none is applied. The soil is black and bears an assessment of Rs. 3-10-4 per acre. Linseed, wheat and cotton are grown according to the prospects of the season, but no definite rotation is followed. The tillage is described as indifferent. The seed was drilled in November and the crop ripened at the end of January. The seed rate, 15 lbs. per acre, is somewhat higher than usual. An outturn of 306 lbs. of oilseed per acre classes the crop, in local opinion, at the average standard. The gross produce was worth Rs. 16-15-1 per acre. The incidence, 21·52 per cent., is high; but probably when cotton is grown the balance of profit to the cultivator is considerably enhanced. The field, measuring 8 acres 7 gunthas

and assessed at Rs. 30, is sublet to a tenant, who pays Rs. 93 for the whole, presumably inclusive of assessment.

The wheat crop (Exp. No. 51) tested by this officer yielded indifferently. The crop was estimated locally at 13 to 14 annas. This estimate, the experimenter thinks, is high, as the crop suffered from deficiency of late rains. The straw was short. The crop was considered average for the district. The field is favourably situated near Bhusával. It has black soil and is assessed at Rs. 3-8-2 per acre. It grows wheat and cotton in alternate years, and was this year lightly manured. A yield of 449 lbs. grain and 580 lbs. straw per acre was worth Rs. 19-12-10 and the incidence is 17·73 per cent.

Mr. S. B. Chitgubi, District Deputy Collector,

Reports what he calls two ordinary experiments. Two test areas were selected in one patch of wheat (the crop only occupied 20 gunthas) and the results from each test area are reported as a separate experiment. The same officer adopted the same course last year. Of the whole area under wheat $\frac{3}{4}$ was actually tested, and although there is a considerable difference between the outturns of each area, the average of both will presumably give a fair average of the whole crop. In the report as submitted there were a good many doubtful points, which on reference have not been all satisfactorily cleared by the officer in charge of the district, Mr. Chitgubi having gone on leave.

The field selected for experiment (No. 52) is a tolerably large number growing a variety of crops. The wheat was not irrigated, but there must be some means of irrigation; for tobacco, brinjals, carrots, chillies, sweet potatoes, onions and plantains each occupied separate areas this year, and some of these crops require irrigation assistance. The assessment, Rs. 2 per acre, indicates that the source of irrigation is outside the number. The area under wheat was liberally manured with 20 loads per acre of cotton refuse. The manure cost Re. 0-8-0 per cart-load. The wheat followed a kharif crop of *mûg*. The experimenter reports a seed rate of 125 lbs. per acre. On reference it is made clear that the ordinary rate of the district is about 49 lbs. per acre. The seed was drilled on the 1st of November and the crop was ripe on the 20th February. Season was fair and tillage good. The outturn is estimated at 12 annas, but there is a doubt whether this does not mean an average or 16-anna crop. The by-product (*bhusa*) is valued at a very high rate, less than 100 lbs. per rupee. If this valuation had been at a fair rate, the gross value of produce would be reduced by at least Rs. 5 per acre. The acre yield is 721 lbs. grain and 992 lbs. *bhusa*. This outturn is reported worth Rs. 32-15-0. The incidence is 6·07 per cent.

Mr. Kázi Kamruddin, District Deputy Collector,

Submits a test on *bájri* and another on wheat. There is some doubt as to the accuracy of the *bájri* outturn figures, as the sample forwarded to my office weighed $6\frac{1}{4}$ tolas less than the reported weight. On reference it has transpired that the bag in which the sample was forwarded was not filled and sealed under the supervision of the experimenter and that the man entrusted to despatch the sample kept it a few days before it was posted. It is suggested that meantime ants got at the sample. I accept the reported figures but with some misgiving, as it is more reasonable to suppose that the sample was tampered with than that the experimenter's figures are wrong.

The field selected for experiment (No. 53) is a large number. It grew this year, besides *bájri*, cotton and *jowári* and had nearly $\frac{1}{4}$ of its area lying waste. *Bájri* with a subordinate pulse was grown on the whole of the field in 1892 and cotton on the whole area in 1891. The field has black soil assessed at Re. 1-9-0 per acre. The season was favourable and the cultivation is described as good. Yet the experimenter's remarks that no manure was applied for four years and that there are spots of *kunda*, a deep-rooted grass, throughout the field, are rather at variance with this statement. The seed was seasonably sown and the crop was ripe at the end of October. It yielded 631 lbs. of grain

and 540 bundles of *kadbi* per acre, together worth Rs. 20-9-7. This is held locally to be an average outturn for the field. The incidence, 7·58 per cent., indicates that the burden of assessment does not press too heavily on the occupant.

The wheat crop tested (No. 54) gave fair results. The field has black cotton soil and grows cotton oftener than any other crop. On a portion of the field cotton was grown two years in succession. *Bájri, jowári,* cotton and *tur* have been grown during the last four years. The field is clean and the tillage is described as good. No manure, however, has been applied for 3 years. The season for wheat was favourable. The crop was drilled in October and ripened early in February. The seed rate, 75 lbs. per acre, is high. A yield of 749 lbs. of grain and 886 lbs. by-product per acre, together worth Rs. 24, classes the crop at the average standard. The field bears an assessment of Rs. 2-7-9 per acre, and the incidence, 10·35 per cent., indicates that a moderate margin of profit was left to the cultivator.

Na'sik.

The programme for this district was not followed. Messrs. Stewart and Hayward were closely engaged with the Yeola disturbance, and the former officer was only able to submit one test. Mr. Thatte sent one test and his explanation of his omission to do the required number is not considered satisfactory by the Collector.

Mr. Hampton, Assistant Superintendent, Deccan Revenue Survey, submitted 19 experiments. The pains taken over the work were misapplied owing to inattention to standing orders. Only four of this officer's tests are reported for reasons given further on.

Mr. R. B. Stewart, Assistant Collector,

Submits what he terms a special test (No. 55), but I cannot class it as such. The field is 16 acres in extent. A revenue peon is the occupant. The tillage work was chiefly performed by contract. The household consists of two brothers, both peons; each has a wife and there are two children. The pay from Government of the two brothers is Rs. 14½ per mensem. In making a special experiment $\frac{1}{5}$th of the holding must be tested. Mr. Stewart's test area was $\frac{1}{80}$th of the occupancy. He does not report whether the crop was average for the district or season. It was rather under average for the field. The occupant does not own his own work cattle. He, however, has a cow and three calves. A *bonâ-fide* cultivator would have a greater supply of home-produced manure for use on the field. No manure was applied to the crop experimented upon. The experimenter attempts to gauge the cost of cultivation. The rates for ploughing and other tillage operations are probably correct, as they are contract rates. Reaping is put at Re. 1-4-0 for the field whilst gathering and bundling cost Rs. 9. These rates are not at all in proportion to what they should be. No charges are made for watching the crop, for threshing the grain or for Local Cess.

The experiment shows, if an average test area was selected, that the gross produce of the field was worth Rs. 184-13-9. The pay of the two brothers is Rs. 174 per annum. These make a total gross income of Rs. 358-13-9. The whole cost of cultivation, if accurately estimated, would be about Rs. 100, leaving a joint annual income for the family of Rs. 258-13-9. The brothers are jointly responsible for an ancestral debt of Rs. 300 and they find difficulty in supporting the household and in paying off the debt. The field experimented upon grows linseed and *jowári* in alternate years. The rainfall was deficient this year in July and August. The field was sufficiently tilled. The seed rate, 7½ lbs. per acre, is slightly under average. The soil is black and is assessed at Re. 1-1-6 per acre. The outturn was 341 lbs. grain and 480 lbs. *kadbi* per acre, together worth Rs. 11-7-8. The *kadbi* is over-valued at 100 lbs. per rupee. The crop is estimated at 14 annas and the incidence works out 9·52 per cent.

Mr. C. M. Thatte, District Deputy Collector,

Reports a gram experiment (No. 56). The field has black soil of superior quality, assessed at Rs. 2-4-5 per acre. Only rabi crops of wheat and gram are

grown; but the assessment indicates that the field is capable of growing cotton and other kharif crops. The crop experimented upon suffered somewhat for want of rain, and is estimated at 10 annas. No manure was applied and the cultivation was indifferent. The seed was broadcasted. A yield of 460 lbs. pulse and 271 lbs. by-product per acre is valued at Rs. 11-6-5. The percentage incidence of assessment, 19·96, is decidedly high. The experimenter ought to have given reasons for the high incidence. It is only partly explained by poor returns owing to an unfavourable season. On reference Mr. Thatte says the field does not grow cotton, but gives no explanation.

Mr. G. H. Hampton, Assistant Superintendent, Deccan Revenue Survey,

Submits in all nineteen tests, which would have been much more valuable if standing orders had been carefully read and strictly followed by the experimenter.

The first five tests were taken on *bájri*, which had subordinate to it *kulthi* or horse gram. The two crops grew mixed in every fourth row, *bájri* alone in the other three. The fields selected have each light soil fairly characteristic of the poorer soils of the Deccan on which *bájri* is the staple cereal crop. The first four fields grow *bájri* annually, presumably with a subordinate pulse crop. The fifth field grows *bájri* every second year in rotation with gram, wheat and *shálu jowári* grown in the alternate year on different parts of the number. The crop of each field was considered a little better than half a good crop and all bear the same anna valuation, *viz.*, annas 11 to 13. The same seed rate is reported for each field, approximately 6 lbs. of *bájri* and 3 lbs. of *kulthi* being sown per acre. This seed rate is probably that general in the district for a mixed crop of *bájri* and *kulthi* and may or may not be accurate for the fields selected for experiment.

The acre averages are worked out on the assumption that a measure ser of *bájri* from each crop weighed 116¼ tolas and of *kulthi* 120 tolas. The weights could not be checked in my office because only one sample was forwarded and it was less than the contents of a measure ser. There is nothing to show that the grain of each field was equally dry when measured and the grain of one test area might have been superior or inferior in quality to the grain of the other test areas. If there were any variations of this sort, and it is almost certain that there were, then there would have been some difference in the weight of the measure ser samples of *bájri* and *kulthi* from each field.

The crops in the second and fifth fields were attacked by caterpillars. The damage in the former was so great that the crop had to be resown. The caterpillars are called *kharpudya*. They eat the young shoots as they appear above ground. These caterpillars die off during rain. But a long drought came after favourable sowing rain in July. For this reason the season was unfavourable. The first, second and third fields do not appear to have been recently manured. The fourth was manured occasionally but not for the tested crop, and the last was lightly manured three years ago. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.				Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.	Remarks.
		Grain.		Straw.					
		Bájri.	Kulthi.	Bájri.	Kulthi.				
		Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	As. p.		
First field	11 to 13 annas.	250	74	384	128	8 4 10	7 3	5·46	Tillage good.
Second do.		101	27	276	108	4 3 2	9 10	14·64	Do. fair.
Third do.		178	46	300	160	6 8 3	6 9	6·47	Do. good.
Fourth do.		536	98	1,288	256	17 7 10	15 4	5·48	Overgrown with grass; tillage careless.
Fifth do.		427	86	864	216	10 10 7	15 11	9·33	Tillage fair.

The experimenter says that as the tested fields are variously assessed, probably the results of all the tests will give a fair average for the district. The results may be average for an unfavourable season; but there is grave

doubt as to the accuracy of the outturn figures, also as to the correctness of the anna estimate of each crop. I regret that I cannot enter the results in the tabulated statement of the report. Mr. Hampton reports that the occupants each cultivate holdings of considerable extent. They are all in debt. They pay interest at the rate of 12 per cent. per annum. The interest is regularly paid but no part of the original debt.

This officer submits three groundnut experiments (Nos. 57—59). The results may with advantage be compared. A portion of each field is classed as garden land. The earthnut occupied in each case the *bágáyat* portion. In the first field the soil is black. The portion under *bhuimug* grows this crop every second year. *Bájri* is rotated with it. The field grew, besides earthnut this year, sugarcane, wheat, chillies and carrots. A dressing of 25 to 30 loads cattle manure was applied per acre for the groundnut. The second field has mixed black soil. It grew this year besides the tested crop, sugarcane, yam, chillies, *bájri*, wheat, &c. Second crops appear to be taken after *bájri*. The *bájri* and groundnut are grown on the same area in alternate years. The groundnut was heavily manured with 30 to 35 cart-loads per acre of cattle manure. This and the previous fields are irrigable by a *pát* leading from a river and also from wells.

The third field is of a different character. The soil is mixed black with a considerable proportion of lime said to be well suited for groundnut. A portion of the field is called garden land. This portion is commanded by two wells, built before settlement. It was formerly irrigated from a *pát* built from a *bandhára*, but the village people who built the *bandhára* have latterly stopped the supply of water. The field has apparently not been classed for water, and for soil is very lightly assessed. The field was lightly manured for groundnut with 4 or 5 cart-loads of cattle manure per acre. The assessments exigible from each field are as under :—

First field, Rs. 5-13-6 per acre, soil and water.

Second do. Rs. 2-12-6 per acre, soil and water.

Third do. Re. 0-3-0 per acre, soil only.

These rates are according to the revision survey. On reference no satisfactory explanation was given as to the lightness of the assessment of the third field. The field grows *bájri* chiefly. This year it also grew wheat, groundnut and small patches of onions, carrots, &c. The rain of June was heavy, but afterwards the rainfall was deficient and the two old wells in the field did not hold an average supply of water.

Each field was sown in the same way. A furrow was opened by a light plough and the seed was dropped by hand into the furrow and was covered by soil moved in making the next furrow. The reported seed-rate is in each case 50 lbs. per acre. This is about average. The crops took about 5½ months to ripen. The cultivation is described in each case as good which presumably means that the fields were well ploughed before sowing and carefully weeded afterwards. The extent of irrigation is not reported. The outturn, &c., results are as under :—

	Anna Estimate	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Nuts in shell (fresh).	Haulms or fodder.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 57) ...	20	3,610	6,302	122 0 0	5 13 6	4·79
Second do. (Exp. No. 58) ...	20	3,938	6,302	132 0 0	2 12 6	2·10
Third do. (Exp. No. 59) ...	18	1,559	4,000	57 8 0	0 3 0	0·32

The experimenter reports that the whole produce of each field was sold green at Manmád, Yeola and Málegaon. The rate at which the principal product

is valued is the retail price obtainable at these markets. If the occupants of the fields found it possible to retail the whole produce the reported values of outturn might have been obtained, but the cost of selling in this manner must have been considerable. The crop of each field was dug by hand, the diggers taking as wages $\frac{1}{6}$ of the produce. Mr. Hampton reports that 3 sers (=$6\frac{2}{3}$ lbs.) of green nuts, when thoroughly dried, weighed almost exactly 3 lbs., thus losing more than 50 per cent. by dryage. The proportional weight of kernels is reported to have been nearly 43 per cent. of the dry nuts with shells. This information is, I think, inaccurate because it does not at all coincide with that recorded in careful experiments by other officers. I think Mr. Hampton's figures are either wrong or the sample was taken from a crop which was unripe.

This officer's sugarcane experiment (No. 60) is subject to the same adverse criticism as his groundnut tests. The outturn is valued at retail rates, and the gross value of produce mounts up to an inordinately high figure. The occupant had three acres of cane. The test area was $2\frac{1}{2}$ gunthas, being less than the minimum allowed by standing orders. The owner would not cut more canes however, because he could not retail in one day the produce from a larger area. At this rate it would take 7 weeks to sell the whole crop. The reasons given for selling the cane in preference to making *gul* are not valid. It is reported that the Khátedár has quarrelled with his brother; he has a small family; he has to depend upon his own exertions, and being in debt wanted to realize quickly. If the occupant obtained the prices quoted, he must have had a number of people selling for him and at places considerable distances apart. The cane from the test area, which was presumably all sold in one day, would, if the crop was a moderately good one, weigh between $2\frac{1}{2}$ and 3 tons. The produce was not weighed. The canes were simply counted and assorted into three sizes—large, medium and small, and the sizes were respectively valued at $\frac{3}{4}$ anna, $\frac{1}{2}$ anna and $\frac{1}{4}$ anna per cane. The average price, irrespective of size, works out about 7 pies per cane. The cost of selling by retail must have been much more than the cost of *gul* manufacture. For, the very best cane is not worth, for *gul*-making, the prices quoted above. I have taken the average of 5 careful tests on sugarcane in previous years and find that the average number of canes (31,350) per acre of these tests is approximately the same as that (31,024) of the crop tested by Mr. Hampton.

For *gul*-making the former were worth less than half the price which Mr. Hampton quotes, who on reference has said that his prices are correct. He writes: "I had enquiries made in Manmád and Yeola. If I saw a man with a sugarcane on bazár day, I always asked what he had paid for it." I think it is certain that if the crop had been sold standing, the owner would have been glad to get perhaps half the reported gross value of outturn.

The field has black soil which is irrigable from a well. No sugarcane had been previously grown. Wheat and *bájri* followed by gram as a second crop are usually taken. The sugarcane was manured with only 20 cart-loads per acre of ordinary manure. The sets for an acre are reported to have cost Rs. 22. The crop is classed at 16 to 18 annas. The outturn, &c., results are as under:—

Number of canes per Acre.		Value of canes.	Assessment per Acre.	Percentage incidence of Assessment.
		Rs.	Rs. a. p.	
Large canes ..	... 16,032	1,102	1 7 7	0·13
Medium ,, ...	... 7,440			
Small ,, ...	... 7,552			
	31,024			

This officer submits four tests on gram, four on linseed and two on wheat. I regret that I cannot report any of them. With one exception all the test areas are below the prescribed minimum. The exception is that of a wheat test.

This crop was the only standing crop of the district. "So all the crows of the surrounding villages had settled on the field and the men were no match for the crows." It is useless testing a field the produce of which was eaten up by birds, and for this reason the results are not reported. Mr. Hampton must have taken a great deal of trouble over his experiments. He could not, however, have read standing orders and instructions carefully and the accuracy of the reported figures of the *bájri*, gram, linseed and wheat tests is so doubtful that I am compelled to reject these experiments. The reasons given for rejecting the *bájri* tests apply also to the gram, linseed and wheat tests. It is clear that the produce from at least some of the fields was measured before the grain was dry. In reply to a reference Mr. Hampton says he had moved from the táluka in which the grain was measured and weighed before the grain was dry. "There was this difficulty that a ser measure full soon after the crops were threshed would not tally in weight with a ser measure full of grain that had been exposed to the sun till it was forwarded, weeks after it was first weighed." By standing orders experimenters are desired to keep a little more than the contents of the local measures, and, when the grain is thoroughly dry, weigh the contents of the measure when properly filled by the dry grain. The acre average should be worked out from this weighment. The same seed rate exactly is given for each gram crop, for each wheat crop and for each linseed crop. All are less than the usual quantities sown. In 8 fields safflower was subordinate to the principal crop. The safflower was not tested, but its outturn was estimated. The gram, linseed and wheat crops, with one exception, bear the same anna valuation. The yields of fields similarly classed vary, so that it is impossible that the anna valuations throughout could be correct.

Ahmadnagar.

Officers in this district were asked to conduct tests on *bájri* and *jowári*, preference being given to the former. Mr. Gibb made one experiment each on *bájri*, *jowári* and wheat. Mr. Sorábji did one on *bájri* and two on *jowári*. Mr. Vádekar sent in only two tests on *bájri*.

Mr. M. C. Gibb, Assistant Collector,

Submits three tests respectively taken on *bájri*, *jowári* and wheat Each was a mixed crop. None of the subordinate crops were tested. The *bájri* was a mixed crop with *mug*, *math*, *ambádi*, and *til*. The cereal gave a poor outturn and the auxiliary crops practically failed. The field, which has light *mál* land, grows the same mixed crop every year. The assessment is Re. 0-12-8 per acre. No manure was applied and the cultivation was careless, weeding having been neglected. The field selected for experiment was sown three times. The seedlings from the first two sowings were eaten by grass-hoppers. The field was sown a third time, late in the season, and probably suffered in consequence. The crop was under average for the village. It was locally estimated as half a good crop, whilst other seasonably sown crops were reported average or nearly so. A yield of 302 lbs. grain and 250 bundles *kadbi* per acre is valued at Rs. 9-15-7. The outturn figures are not recorded in the tabular statement of the report.

The *jowári* crop experimented upon (No. 61) had subordinate to it safflower and linseed in every fourth row; therefore *jowári* occupied $\frac{3}{4}$ of the test area; but the outturn averages as recorded show the actual yield of *jowári* from an acre. The outturn of *jowári* is an indefinite proportion of the actual acre yield of the mixed crop. It is not reported whether the subordinate crops promised to yield well or not. The field has black soil and bears an assessment of Re. 0-12-5 per acre. *Jowári* and *bájri*, each having auxiliary row crops, are grown in alternate years. This year the field was deeply ploughed in the fair season and well prepared for the *jowári* which was a rabi crop. No manure was applied. The crop was very uneven over the field. Count was taken of this in selecting test areas. The season was fair. The seed was drilled early in October and the crop was harvested on the 20th January. It yielded 420 lbs. grain and 417 bundles of *kadbi* per acre, together worth Rs. 13-9-1. This is called a 13-anna crop. The incidence, 5·72 per cent., is moderate.

The wheat experimented upon (No. 62) had a sprinkling of safflower. The field has black soil assessed at Re. 1-1-8 per acre. The season for wheat is described as indifferent. The field was ploughed in June, and well harrowed afterwards. The seed was seasonably sown at the end of October. The reported seed rate, 20 lbs. wheat and $\frac{3}{4}$ lb. safflower, is decidedly under average. The crop took $3\frac{1}{2}$ months to grow. The period of growth indicates that there was little, if any, lack of moisture in the soil. The by-product was neither weighed nor measured and is only valued at 4 annas per acre. A yield of 479 lbs. of grain per acre, which, with the straw, is worth Rs. 12-6-0, classes the crop at 11 annas. The incidence works out 8·92 per cent. The experimenter kept only a ser of wheat. By dryage the grain shrank, so that it did not quite fill the ser measure. This probably accounts for the sample sent to my office weighing $2\frac{3}{4}$ tolas short of the reported weight. The difference does not affect the accuracy of the acre outturn figures, because Mr. Gibb's calculations were based on the weight of a $\frac{1}{2}$ ser measure of dry grain. He had enough dry grain to properly fill that size of measure.

Mr. Sorábji Padamji, Assistant Collector,

Sends three careful tests, the first on *bájri*, the others on *jowári* with subordinate rows of safflower.

The field on which the *bájri* experiment (No. 63) was made is partly classed as *bágáyat* and partly as dry-crop. The garden portion bears a light assessment and is irrigable from a well which, however, has a scanty supply of water. *Bajri* alone is grown in alternate years with *bájri* and subordinate pulses. In the year when *bájri* alone is taken a second irrigated crop of wheat or gram is grown on a portion of the number. The field has a thin layer of black soil overlying a substratum of lighter coloured earth. The assessment is Re. 0-5-6 per acre. The field was well ploughed and otherwise well tilled for the *bájri*, but only a light dressing of manure was given. The crop, which grew from seed rather unseasonably sown in August, because the first sowing failed, was harvested in November and yielded 677 lbs. grain and 2,060 lbs. of useful by-product per acre. The gross value of outturn comes to Rs. 20-5-10. The crop is, I think, under-estimated at 8 annas. The incidence, which works out 1·68 per cent., indicates that the burden of assessment is very light.

This officer's second and third tests (Nos. 64 and 65) each on *jowàri* and safflower may with advantage be compared. Each field grows the same mixed crop every year. The soil is in each case black. The first field is assessed at Re. 0-11-5 per acre and the second at Re. 0-7-6. Neither field was manured, but the former was better tilled than the latter. The crop in the first suffered from cloudy weather in December; that in the second from want of rain. In the first field there were 3 rows of *kardai* to 15 of *jowári*; in the second field it is reported that there were 3 rows of *kardai* to 10 of *jowári*. The *jowári* rows were probably 9 in number. Probably a 3-coulter drill was used and 9 continuous rows of *jowári* alternated with 3 continuous rows of safflower. The first field lies in an outlying village, the other near a táluka station; therefore the *kadbi* and useful by-product of the former is valued at a lower rate than that of the latter. The by-products of each field are valued very low, the rate for *kadbi* being respectively 8·84 cwts. and 6·22 cwts. per rupee. The first field had a higher seed rate than the second, the former being about average. Each field was drilled in September. The first was harvested on the 19th January; the second on the 31st of January. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre,			Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Jowári grain.	Safflower seed.	Useful by-product			
	As.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
1st field (Exp. No. 64) ...	12	615	66	2,475	14 12 0	0 11 5	4·83
2nd do. (Exp. No. 65) ...	10	447	174	1,960	16 9 11	0 7 6	3·71

The second field is 14 acres 36 gunthas in extent. The assessment is Rs. 7 for the field. The whole number has been leased to a tenant during the last 10 years for Rs. 50 per annum. The superior owner, a Bráhman, pays the Government assessment.

Mr. V. B. Vádekar, District Deputy Collector,

Tested two *bájri* fields (Exp. Nos. 66 and 67). The results may, I think, be accepted as average for an ordinary season. The fields selected are much alike in character. Each has light black soil, retentive of moisture to a certain extent. There was ample sowing rain and each field was drilled early in July. The first field had an application, in May, of ten loads per acre cattle manure. The second field was in the same month manured with 5 loads cattle manure. Each field was well ploughed and carefully tilled. A long break in the rains after sowing affected the crops experimented upon less injuriously than those growing on lighter soils. Fields with thin light soils had to be re-sown, still the crops generally approached the average standard. The fields tested grow *bájri* every year. The reported per acre seed rate in each case is 6 lbs. The crops were reaped on the 23rd and 24th November. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
1st field (Exp. No. 66) .	16	532	1,341	17 9 4	1 0 0	5·68
2nd do. (Exp. No. 67) .	14	438	889	14 11 8	0 13 8	5·79

Poona.

Ten experiments have in all been received from this district. Mr. Bagnell closely followed the programme laid down for him, *viz.*, one test each on rice, *rági* and *bájri*. Mr. Fry, owing to exigencies of tour, had to alter it a little, and he did two tests on *jowári* and one on gram.

Mr. Young, Divisional Inspector, L. R. and Agriculture, C. D., submits two carefully reported tests, one on spelt wheat and another on groundnut.

Onions and sugarcane were selected by Mr. Mollison for experiment, and one test on each has been reported.

Mr. H. W. J. Bagnell, Assistant Collector,

Reports three tests—one test each on *bájri*, *nágli* and rice. The *bájri* (Exp. No. 68) yielded exceptionally well, yet the anna valuation is only that of an average crop. The experimenter says that the crop was an ordinary one of no exceptional promise. For *bájri* the season was more than ordinarily favourable in the Poona district. The heads of grain were generally well filled owing to absence of rain when the *bájri* flowered, and this circumstance, I have no doubt, helped the outturn considerably although, if casually examined, the crop might not have appeared of exceptional promise.

The field varies in character. One-third of the whole number has soil only 8″ deep, whilst the remainder has good black soil 2 feet deep. The experimenter says the crop throughout was even. No count appears to have been taken as to the variation in the soil in selecting the test area. The following is the sequence of crops taken during the previous 3 years :—

1890-91	... Groundnut.
1891-92	... 1 Bájri. 2 Gram.
1892-93	... 1 Bájri. 2 Gram.

The field is irrigable from the Khadakvásla canal and the second crops of gram as well as the groundnut were irrigated from the canal. No manure was applied for the *bájri*, but the tillage was sufficient. The reported seed rate, 14 lbs. per acre, is slightly above average. The seed was drilled in July and the crop was ripe early in November. It yielded 906 lbs of grain and 3,476 lbs. *kadbi* per acre, together worth Rs. 29-15-3. The field is assessed at Re. 1-15-5 per acre and the incidence works out 6·55 per cent.

On red *mál varkas* land, assessed at Re. 0-9-6 per acre, *nágli* (Exp. No. 69) was only a middling crop. It was grown from transplanted seedlings, raised on a rábed seed-bed. On a seed-bed of 20 gunthas, 10 loads of cowdung were burnt in March, along with grass as auxiliary ráb material. The area of seed-bed to acre of transplantation is not reported, but the seed rate is stated at 16 lbs. per acre; but how this is arrived at without knowing proportionate area of seed-bed to field is not clear. The field was not manured. It lies fallow for three years and then grows in successive years *nágli*, *jowári* and *til*. There was deficient rain at Dasara (October), otherwise the season would have been quite favourable. Late or *garvi nágli* was grown—a variety superior to *halvi* or early *nágli*.

A yield of 550 lbs. grain and 630 lbs. by-product per acre, together worth Rs. 15-7-6, is estimated locally as a 15-anna crop.

The rice crop tested (No. 70) gave satisfactory results. It is assessed at the maximum anna valuation. The crop was grown from transplanted seedlings. A 12-guntha seed-bed was rábed with 12 cart-loads of cowdung; grass was also burnt, but the quantity burnt is not reported. A seed-bed of the size noted was sown with approximately 50 lbs. seed and apparently furnished seedlings for an acre. But this is not clear. If my conjecture as to the seed rate is right, then the seed rate is very high. Goats are folded in the field to manure it every 4th or 5th year. The soil is sticky and retains too much water to grow a second crop. Rice is grown every year. The assessment is Rs. 2-9-3 per acre, and the burden of assessment does not appear to weigh heavily on the occupant. The crop yielded 2,326 lbs. grain and 3,360 lbs. straw per acre. These together are valued at Rs. 58-7-0.

Mr. T. D. Fry, Assistant Collector,

Sends three crop test reports, two on *jowári*, with, in each field, safflower subordinate to the cereal, and the third on gram also with subordinate rows of safflower. Each crop was a rabi one, and as the October-November rains were scant, the season was unfavourable. *Jowári* and gram were affected unfavourably to a greater extent than safflower by the character of the season.

One *jowári* experiment and one on gram (Nos. 71 and 72) were undertaken on the same field. This field comprises $\frac{2}{3}$rd of a large number, $\frac{1}{3}$rd of which this year was waste. The field has medium black soil assessed at Re. 0-11-2 per acre. It grows *jowári* and safflower every year, small patches being sown annually with gram and safflower. A very light dressing of manure, 8 loads for 29 acres, was applied in May. The subordinate safflower was not quite ripe when the *jowári* was tested; but the safflower in the gram was ready for harvest, and it was experimented upon. The outturn figures thus obtained are held to apply alike to both portions of the field. There can be no great objection to this, as the conditions of cultivation were about the same, and the safflower in each area was locally estimated at the same anna valuation. The gram seed rate is not reported, as authentic information was not obtained.

The second *jowári* test (No. 73) was taken on light friable black soil assessed at Re. 0-13-2 per acre. No manure was given. The cultivation for this as for the other crops experimented upon is described as careful. The field grows *jowári* and *kardai* every year. In this field and the other field tested, the principal and subordinate crops grew in the proportion of 7 to 1. Twenty-one continuous rows of *jowári* alternated with 3 rows of safflower. It is common to sow *jowári* and safflower in this manner through a wide district east of Poona. The proportion of area of cereal to that of oilseed varies between fields. In the fields selected for experiment the respective seed rates were as under :—

			Lbs.
First field...	...	Jowári ...	... 7½
		Safflower ...	... 2
Second do.	...	Gram ...	... not reported.
		Safflower ...	... 2
Third do.	...	Jowári ...	... 5½
		Safflower ...	... 1

The seed was sown in October, and the crops ripened in January. The following table shows the outturn, &c., results :—

	Crop.	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
			Grain.	By-product.			
		As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 71)...	Jowári ...	11	276	1,420	10 13 7	11 2	6·43
	Safflower ...	16	54				
Second do. (Exp. No. 72) ..	Gram ...	5	139	202	5 0 10	11 2	13·81
	Safflower ...	16	54				
Third do. (Exp. No. 73)...	Jowári ...	13	651	2,260	18 2 2	13 2	4·54
	Safflower ...	20	94				

The crop of the second test was a comparative failure ; therefore the incidence is not unduly high. The result of this test may be accepted as about average for the greater portion of the gram crops of the Poona district, which were exceptionally poor last year where not helped by irrigation.

Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.,

Reports 2 well conducted and carefully reported crop tests. The first (No. 74) is on irrigated spelt or *khapli* wheat. The field has deep black soil assessed at Rs. 3-4-1 per acre. The whole number is irrigable from a well assisted by a channel leading from a *bandhára*. The *pát* irrigation is only available with an ordinary rainfall up to the end of November. The sequence of cropping during the past three years indicates that there is enough water only for a portion of the field. The area of the whole number is 8 acres 24 gunthas. This year 3 acres and 15 gunthas were under wheat and ground-nut ; the remainder under dry-crop wheat with safflower. Eighteen cart-loads of ordinary manure per acre were applied to the irrigated portion. The preparatory tillage for the wheat was careful. The field was ploughed with an 8-bullock plough in May and subsequently harrowed three times with a heavy harrow and twice with a light harrow. The seed was drilled first lengthwise and then across the field. The reported seed rate, 86 lbs. per acre, is about average for an irrigated crop. The crop is said to have been bullock-hoed a month after sowing but this was impossible owing to the manner in which the seed was sown. The crop was hand-weeded once, probably twice. There were no weeds. The crop was sown in September and was ripe in February. It is estimated as an 18-anna crop and yielded, per acre, 2,289 lbs. of husked grain worth Rs. 84-8-9, and 2,160 bundles of straw which I think are over-valued at Rs. 10-12-9. The reported gross value per acre is Rs. 95-5-6. The incidence is only 3·41 per cent.

The whole number has been let by the occupant to a tenant. The occupant takes half the produce and pays for ½ seed, ½ manure, ½ cost of *môt* and well fixings and the whole of the assessment. All other expenses of cultivation are borne by the tenant.

This officer's second test (No. 75) on groundnut affords useful information. The selected field has better irrigation facilities than that of the previous test. The portion of the number under groundnut has good deep black soil assessed at, soil and water combined, Rs. 5-1-1 per acre. It is irrigated from a well and also from a *pát* leading from a *bandhára*, which in an ordinary season supplies water to the middle of February. The area of the whole number is 15 acres 30 gunthas, of which 4 acres 28 gunthas is *jiráyat* and the remainder *bágáyat*. The whole assessment is Rs. 62. A tenant has leased the whole number for two years at Rs. 175 per annum. The superior holder pays the assessment; all expenses of cultivation, &c., are paid by the tenant.

The field is well cultivated, being annually ploughed in the fair season with an 8-bullock plough. Before sowing in June the land was repeatedly harrowed with the heavy and light harrows and dressed with ordinary manure, of which 16 cart-loads per acre were applied. The reported seed rate, 51½ lbs. shelled nuts per acre, is about average. The seed was drilled in June. The crop subsequently was repeatedly handweeded and was evidently dead ripe at harvest time, 15th February. I judge of this because the haulms must have been dry and withered. They weighed less than the nuts. The haulms are reported to have no value. Usually they are green when the crop is dug and are then an excellent fodder. The crop was dug by hand. Women, children and old men were employed and got as wages ¼ of the produce. This is a greater proportion than usual. But it is not so easy to dig the crop on dense black land as on light soil. The season was favourable. The extent of irrigation is not reported. A yield of 2,755 lbs. per acre of unshelled nuts is reported as an average outturn and is valued at Rs. 83-3-9. The incidence works out 6·09 per cent.

Mr. J. W. Mollison, Superintendent of Farms,

Reports a test (No. 76) on red onions. The crop tested occupied the lowest lying and best portion of a large number. Part of the number has poor light soil. The portion experimented upon has mixed black soil and might fairly bear an assessment of Rs. 2-4-0 per acre, the average of the whole number being Re. 1-4-9. The registered owner bought this and several adjoining numbers two years since, and estimates that the portion experimented upon cost him Rs. 300 per acre. Twelve to 15 acres of the whole property might be considered equally valuable. This area is either commanded by a well or could be irrigated from the Khadakvásla canal. But the canal water has to be lifted and half the usual water rate is charged. The land which is irrigated grows sugarcane, plantains, lucerne, &c.

The area under onions grew *hundi* (green fodder *jowári*) in 1892-93 and chillies in 1891-92. As usual the onions were transplanted from a seed-bed. The seed was sown in October. The proportionate area of seed-bed to acre of transplantation was 4·58 gunthas. Nineteen and half pounds seed was sown for an acre of transplantation. If it had been sound, which onion seed seldom is, 5 lbs. less ought to have sufficed.

The preparatory tillage of the field was liberal. The heavy plough was once used. Afterwards the field was four times harrowed. The total application of ordinary farm-yard manure was 43 loads per acre, of which ⅚ was applied before plantation, the remainder as a top-dressing. Beds were formed. The seedlings were carefully lifted from the seed-bed, and half the green tops clipped off before they were transplanted 3 or 4 inches apart in the beds. The seedlings are reported to have been transplanted in December, but it is probable that the correct date was some time in Jauuary. The crop was subsequently handweeded and regularly watered. There was an interval of 7 or 8 days between each watering. Water was withheld for 3 weeks before harvest, to allow the soil to dry, so that the onions were lifted clean. The crop was dug on the 7th of May by men by means of ordinary country picks. Women following removed the tops and roots with a sickle. The test area, 2·73 gunthas, was an exact number of beds. This area was below the prescribed minimum, but the available labour did not permit a larger area being tested in one day. The outturn, &c. results are as under:—

	Anna Estimate.	Outturn per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 76	17	26,974	147 8 2	1 4 9	0·88

The experiment goes to prove that the formulæ in respect of onions require revision. The crop was undoubtedly a good crop, but better crops are grown in

the Poona district. The outturn approximates that of two tests taken in the Khed táluka in 1889-90, but the value of the crop is much less. The market rate, Rs. 3-8-0 a Khandi of 640 lbs. at date of experiment, was very low. Last year from the same holding onions were sold at Rs. 7-4-0 per Khandi. If kept a few months the tested crop would be worth a much better price; but during storage onions lose weight by dryage. The sample kept lost 11·2 per cent. in 11 days. This loss is allowed for in the reported outturn figures. The figures given by the occupant, if accurate, show that the crop was grown at a loss. All the labour was hired labour.

This officer also submits a sugarcane experiment (No. 77). The field has medium black soil and is assessed at Re. 1-4-9 per acre. It is irrigable from the Khadakvásla canal. The water-rate for sugarcane is Rs. 25 per acre. The crop was liberally cultivated and heavily manured with 56 loads farm-yard manure per acre before plantation and a top-dressing of fish manure in August. The total application cost more than Rs. 200 per acre.

The experiment was undertaken chiefly to determine the area of standing cane required to furnish sets sufficient for replanting an acre of new cane. Concurrently, the number and weight of sets required for an acre of transplantation and other information of interest was also obtained. The cane tested was bought as a standing crop at Rs. 500 per acre. The cane was required for planting the field recently taken up by the Agricultural Department for the experimental cultivation of cane at Mánjri Budruk. The crop experimented upon was quite even. The canes were of moderate length and thickness and for this reason were well suited for replanting. Large coarse canes are not well adapted for sets, because the nodes are so far apart. Ratoon cane provides the best sets, because the nodes are so close together.

A given weight of ratoon cane will furnish a much larger number of sets than the same weight of new canes. If the crop experimented upon had been converted into *gul*, it would have been classed as a 14-anna crop, and it has been estimated at that standard; but as a crop yielding cane suitable for replanting, it could not have been much better.

The agreement with the owner was that the stripped dry leaves should be left on the ground and that the cane should be cut a little above the soil level. The latter condition was necessary, because the owner intended to grow a ratoon crop the following year. The crop was purchased at fair value. This is judged by results. Sets were being sold in the district at Rs. 3 to Rs. 3-8-0 per 1,000, ratoon sets being dearest. The cane from the test area cost Rs. 50. The cost of cutting, stripping, carrying, cutting into sets and weighing the cane cost Rs. 5-14-0. In ordinary practice the cost would have been at least $\frac{1}{3}$ less, as weighing the canes and counting the sets added to the cost.

Four gunthas yielded 7,132 lbs. of cane. The cane was cut into 18,117 sets worth, at Rs. 3 per thousand, Rs. 54-5-7. The value of green tops 993 lbs., as fodder, say Rs. 2, added to this, makes a total of Rs. 56-5-7.

The sets were sufficient to plant almost exactly 1 acre and 4 gunthas. Therefore 1 acre of fair cane will replant 11 acres at a cost (for sets) of practically Rs. 50 per acre.

The registered owner bought in 1892 five survey numbers, area 43 acres 25 gunthas, assessed at Rs. 64, for Rs. 12,000. He has since resold 3 survey numbers, area 21 acres 14 gunthas, assessed at Rs. 34, for Rs. 6,500. The above transactions prove the enormously enhanced value of landed property in the district, owing directly to the extended cultivation of sugarcane and indirectly to the irrigation facilities afforded by the Khadakvásla canal. Moderately good land under the canal is worth Rs. 30 to Rs. 40 per acre per annum, and tenants readily agree to pay that rent.

The following shows approximately the cost of cultivation of the crop tested:—

Area—1 acre.

	Rs.	a.	p.
First ploughing with heavy plough and 8 bullocks...	11	0	0
Second and third ploughings	16	0	0
Clod-crushing and levelling	2	0	0
56 loads Farm-yard manure and cartage ...	155	0	0
Spreading do. do.	1	2	0
Ridging	3	0	0
Making water compartments and water-channels by contract	2	4	0
Cost of sets	50	0	0
Carting sets, carrying to beds and planting ...	4	0	0
Watering, manual labour, 24 waterings ...	9	0	0
Water rate for canal water	25	0	0
3 hand-weedings; 1st in April; 2nd in May; 3rd in July	7	0	0
2,400 lbs. of fish manure, cartage and cost of application	52	8	0
Hand digging and making new beds in August ...	9	0	0
Assessment	1	4	9
Interest on invested capital, say, Rs. 630 at 7 per cent.	44	0	0
Total ...	392	2	9
Value of crop ...	500	0	0
Profit per Acre ...	107	13	3

Shola'pur.

In this district Mr. Brown was asked to experiment on rice, *bájri*, linseed, gram and sesamum. He reported on the last four. Mr. Scott was called upon to test *bájri*, rice, linseed and gram. He forwarded 2 gram tests only. He explained that he had arranged for two other tests, but the crop in one case was spoiled by rain and in the other case the harvest was delayed owing to the same cause.

Mr. Young, Divisional Inspector, L. R. and Agriculture, Central Division, submits a gram and a *jowári* test from this district.

Mr. R. C. Brown, Assistant Collector,

Submits in all 5 tests. The first two were taken on *bájri* and *til* which grew in different portions of the same number. With the *bájri* was grown *mug*, maize and *tur*; and with the *til*, *mug* and maize. None of the subordinate crops were tested. The extent of the mixture in each field has not been reported. The experimenter's acre averages are based on weights of measured quantities totally different from the weights of the samples of *bájri* and *til* forwarded to my office. The differences are respectively 45¼ tolas and 42⅓ tolas. On reference no explanation has been offered. I am unable therefore to report the outturn figures in the tabulated statement of the report. The field has rich loamy soil. It lies low and holds well whatever moisture there may be. The season was good. No manure was applied, and there was no attempt at careful cultivation. The *bájri* only yielded 91 lbs. of grain worth, with the straw, Rs. 3-7-6 per acre. The *til* produced 172 lbs. of oil-seed per acre, and this outturn is valued at Rs. 8-4-2.

This officer's third test, on gram, is also unsatisfactory. The crop was sown late, therefore the season was not favourable. The soil is assessed at Re. 0-9-8 per acre. I quote the following from the experimenter's report:—

"The field experimented upon was a very poor soil to look at and the crop a wretched one; but the field is typical of those in this district, the soil being a sort of *murum* and lying high. The rain had not fallen seasonably for the crop, and no artificial means had been taken to improve the outturn. *Jowári* and *kardai* are the usual crops grown in the field and with them gram, linseed and *tur* are sown quite casually and not with any method."

This would indicate that the gram was sown sparingly mixed with the other crops named. On reference the experimenter reported that gram occupied 1

acre or $\frac{1}{20}$ of the whole field. The actual outturn from an acre is 107 lbs. worth Rs. 2-9-10. If gram occupied $\frac{1}{20}$ only of the test area, the outturn is greater than could be obtained from the best land under the most skilful management; whilst if it occupied the whole of the test area, it must have been grown alone, and the outturn is so miserably poor that it is much under average and therefore cannot be reported.

In the fourth test (No. 78) gram and safflower occupied different rows. A reference to the experimenter has elicited that 4 sers of *kardai* and 12 sers of gram were sown per acre. But there is nothing to show the respective areas under each crop. The safflower was not tested. The outturn of gram must, therefore, be taken as an indefinite proportion of the yield from the field. "The crop and soil were both of an excellent description. The soil was rich black and deep, and the crop of gram strong and sound." The experimenter further reports that there was "a little too much rainfall, otherwise the crop would have been the best producible." The cultivation is, however, described as indifferent and the crop is only estimated at 14 annas. Independently of the safflower the gram yielded 606 lbs. pulse per acre, worth Rs. 16-5-10. The by-product was neither weighed nor valued. I have some misgiving in reporting the outturn figures in the tabulated statement of the report.

Mr. Brown's last test (No. 79) is on linseed. It was grown on a field which usually grows *jowari* every year. The soil is black and bears an assessment of 12 annas per acre. The cultivation is described as indifferent. No manure was applied. The season was favourable. The reported seed rate, 25 lbs. per acre, is double what it ought to have been. The seed was sown about the 11th October and the crop was harvested on the 30th January. It yielded 160 lbs. per acre of oilseed, worth Rs. 8-7-0. This was locally considered a 10-anna outturn. The incidence, 8·88 per cent., is moderate.

Mr. G. Scott, District Deputy Collector,

Sends 2 gram tests (Nos. 80 and 81). Each crop was grown on rather inferior soil. The fields are respectively assessed at Re. 0-5-4 and Re. 0-4-5 per acre. These are revision survey rates. The second field is irrigable from a well built since settlement, and the tested crop was irrigated once. In the first field *jowari* is ordinarily grown. Gram is taken occasionally as a change crop. But the occupant is apparently not well-to-do, and did not take the opportunity of thoroughly cultivating the field during the monsoon. This a good farmer would have considered essential for successfully growing a good rabi crop. The field was not ploughed. It was merely harrowed. No manure was applied. The season was fairly good.

The second field experimented upon grew gram after *bajri* in the previous year and *jowari* will be grown next year. The preparatory tillage for the gram was more liberal than in the first field. The heavy plough was used and the field was also twice harrowed. No manure was given. The seed rates are respectively for each field 38 lbs. and 30 lbs. per acre. Each crop was drilled seasonably, and each ripened towards the end of January. The sample ser of gram of the first crop weighed in my office $8\frac{5}{8}$ tolas short. The difference cannot, as suggested by the experimenter, be entirely due to dryage. The by-product was neither weighed nor valued because considered worthless. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn of pulse per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 80)	12	352	7 11 4	5 4	4·32
Second do. (Exp. No. 81)	8	398	8 12 0	4 5	3·15

The incidence is very moderate in both tests. The better outturn in the second field may be fairly attributed to better cultivation and the effect of a single watering given to the crop.

Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.,

Submits two careful tests, one on *jowari*, the other on gram. The *jowari* field (Exp. No. 82) has black soil which varies in character on different parts of the number. The crop varied with the soil, and to get a fair average, several test areas were selected. The assessment is Re. 1-0-11 per acre. The field extends to 7 acres 22 gunthas. The full assessment is Rs. 8. The field was sold in 1891 for Rs. 300 and was this year rented by a tenant for Rs. 50. The superior holder pays the Government assessment. His net profit is probably about Rs. 5½ per acre. In 1891 the number was let for Rs. 87 and in 1892 for Rs. 70. The field is free from weeds, and it is only ploughed once in 2 or 3 years. This year it was only harrowed, the first time in July and the 2nd time in August. The seed, 10½ lbs. per acre, was drilled in September. This rate is perhaps somewhat over average; but a high seed rate gives better fodder and probably the *kadbi* has an extra value as the field is in the vicinity of Pandharpur. A month after sowing, the crop was bullock-hoed. The season was favourable. A yield of 477 lbs. grain and 2,330 lbs. *kadbi* and chaff was valued at Rs. 19-3-3. This outturn was classed locally at 12 annas.

This officer tested gram (No. 83) in a field which also has changed ownership recently. The whole number measures 34 acres 4 gunthas and bears an assessment of Rs. 38 or Re. 1-1-11 per acre. Half of the number was sold for Rs. 550 or about Rs. 32 per acre. The experiment was undertaken on this half. *Jowa'ri*, safflower and gram generally grow annually on the field. The safflower is probably a mixed crop with the *jowâri*. The gram never occupies the same area in two successive years. Linseed sometimes takes the place of gram. The soil is deep black. The field was last ploughed in 1891-92. In April and again in July it was harrowed, and a month after sowing was bullock-hoed. The seed, 24½ lbs. per acre, was drilled in September. The seed rate is under average. The crop ripened in January and yielded 788 lbs. of pulse and 600 lbs. of useful by-product per acre, worth together Rs. 21-3-2. The cultivator considered the crop a 12-anna one, while the experimenter believed it to be an average crop for the district and the field. The incidence, 5·28 per cent., is moderate.

Sa'ta'ra.

The programme originally settled for this district was only very partially followed. The Collector explains that this was due to frequent changes of officers during the season.

Mr. W. C. Rand, Assistant Collector,

Sends three tests—one on *jowari*, the other two on gram. The *jowari* crop experimented upon (No. 84) may or may not have been average for the village. Most of the other fields were harvested before the test was made. The selected crop was about average of those not harvested. The field has reddish black *mal* soil and bears an assessment of Re. 0-15-10 per acre. *Ba'jri* and *jowa'ri*, each with a subordinate pulse mixture, are grown alternately. *Mug* (green gram) was auxiliary this year to the *jowari*. It was not tested. Occasionally the field is manured, but there was no manure to spare for it this year. The season was fair and the tillage good. The crop was drilled in June and reaped in November. About 12 lbs. per acre is the reported seed rate. It is higher than ordinary. The outturn, independent of the green gram which occupied ⅙ of the field, was 302 lbs. grain and 2,252 lbs. *kadbi*, together worth Rs. 15-7-6. The incidence, 6·41 per cent., is moderate.

This officer's gram tests (Nos. 85 and 86) were taken on black soil fields, assessed respectively at Rs. 4-0-11 and Rs. 4-1-4 per acre. The October rains were insufficient, otherwise the season was favourable. The first field was not directly manured for the gram, but an application of 7½ cart-loads per acre was given for the preceding rain crop. The second field was very slightly manured for the gram. The rotation is undefined, but the former grows mostly rain crops, whilst the latter grows chiefly rabi crops. The assessment of each field indicates that both are capable of being double-cropped during favourable seasons. In each the tillage for the gram is described as good. In both fields gram was a 2nd crop after *udid*. In the first field gram grew alone. In the second there was a sprinkling of linseed and safflower. The auxiliary

crops were not tested. Both fields are held free of assessment by Saranjámdárs. The superior holder of the first field has leased six acres, including the area under the crop experimented upon, to a tenant for Rs. 50, or about double the assessment. The second field is cultivated by a tenant who pays Rs. 25 for the field (2 acres 18 gunthas) or about 2½ times the assessment. Each field was sown seasonably in October and both tests were taken on the 23rd January. The by-product was in neither case weighed nor valued. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn of pulse per Acre.	Value of Outturn	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 85)...	16	438	13 11 10	4 0 11	29·53
Second do. (Exp. No. 86)...	18	540	16 8 1	4 1 4	24·74

The incidence on both fields is for 2nd crops only.

Mr. S. R. Arthur, Assistant Collector,

Submits an interesting sugarcane experiment (No. 87). The sugarcane only occupied a portion of the number. The soil of this area varied considerably, being sandy on one side and gradually changing to black soil on the other. The crop varied with the soil and necessitated the selection of two test areas, one on the best portion of the crop and the other on the poorest. The outturn of one test area varies considerably from that of the other. Sugarcane is taken every third year and follows groundnut which is preceded by *shálu jowári*. The whole number is classed as dry-crop soil, but in part is irrigable from a well constructed since settlement. Various crops were grown this year, *viz.*, sugarcane, *shálu jowári*, groundnut, chillies, irrigated and dry-crop wheat, turmeric, &c. The assessment is Re. 1-14-6 per acre. The field appears to have been well prepared for sugarcane. The sets were planted in April. Before this the field was ploughed 6 times, the first time in January, the last time at the beginning of April. During March and before the last two ploughings 1,200 sheep were folded for 8 nights on the area under cane (1 acre 14 gunthas). Afterwards a dressing of 15 cart-loads ordinary manure per acre was given. Before plantation ridges were drawn and beds formed and flooded. The sets were planted in the furrows, being trampled down in the mud in the ordinary way. Immediately after plantation, the irrigation was frequent. Thereafter water was given once a week. During heavy rain the well irrigation was suspended. At all other seasons it was regular. Fourteen hundred whole canes appear to have been used to provide sets for an acre. If these canes were of ordinary size, they could not have furnished sufficient sets, and they certainly would not have done so, if, as reported, each cane was cut up into 3 or 4 pieces, each piece having 3 or 4 nodes. This would give 4,200 to 5,600 sets per acre, whilst 4 times that number are necessarily required.

In expressing the juice the old fashioned wooden roller *charak* (mill) was used. It was yoked with 2 pairs of bullocks at a time. The percentage weight of *gul* to cane indicates that an iron roller mill would have given better results. The percentage of *gul* to cane is under average. The evaporating pan was capable of boiling about 1,050 lbs. of juice at a time, and about 3 hours elapsed before evaporation was complete. The following results, per acre, were obtained from each test area :—

	Plot A.	Plot B.
No. of canes...	25,700	22,600
	Lbs.	Lbs.
Weight of canes stripped and topped	49,460	30,940
Weight of green tops	19,980	13,620
Weight of juice	29,360	16,620
Weight of gul	5,280	3,040
Percentage of juice to cane	59·3	53·7
Do. gul to juice	18·0	18·3
Do. gul to cane	10·6	9·8

The tops cut from the canes were in part of value for replanting as sets and in part of value only as fodder. The former were valued at Rs. 37-8-0 per acre, the latter at Rs. 20 per acre. The outturn, &c., results of the whole crop are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Gul.	By-product.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 87.	10	4,227	16,805	260 11 2	1 14 6	0·73

Mr. R. J. C. Lord, Assistant Collector,

Submits a *jowári* test (No. 88) which is not in all respects satisfactory. The crop tested had subordinate to it gram and safflower. The auxiliary crops were reaped before the experiment was made. But without personal knowledge Mr. Lord reports that the subsidiary crops practically failed. It is probable that they did, because the *jowári* yielded so well that it would have certainly more or less suppressed any other crop subordinate to it. The crop experimented upon was a second crop after a mixed rain crop of maize and *udid*. The ordinary rotation is undefined, but there is evidence to prove that various crops are grown, that the land is double-cropped occasionally, and that the system of propping could only be followed if the land was liberally farmed. The field is small, being 39 gunthas. It bears an assessment of Rs. 2-9-0 per acre. The soil is mostly black, but is rocky in parts. The field is reported to be rented to a tenant for Rs. 4, the superior holder paying the Government assessment. Thus he only makes a profit of Re. 1-7-0 per acre and derives as a landlord an unusually small advantage from his property.

The field was manured with 8 cart-loads of ordinary manure, per acre, for the rain crop, but no manure was directly applied for the crop under experiment. The tillage is described as good and the season favourable. It is reported that the crop was thrashed two days after harvest. The sample of gram sent to my office weighed nearly 10 tolas short of the reported weight, and it is probable that the sample was not dry when weighed by the experimenter. If such was the case, the reported yield should be reduced by $\frac{1}{12}$ approximately. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
Experiment No. 88.	12	1,268	2,938	36 15 0	2 9 0	6·93

The incidence for a second crop is extremely light. The anna valuation is, I fear, an under-estimate. The yield, if correctly reported, indicates that the crop was a full maximum one.

Mr. J. M. Cursetji, District Deputy Collector,

Sends a sugarcane test (No. 89) which is fully and carefully reported. The experiment was made on a number which is rented by a Máli for Rs. 115. The Government assessment on the number (7 acres 37 gunthas) inclusive of water rate, is Rs. 34. This the superior holder pays. The Máli is assisted by two brothers, and the combined family numbers 20 individuals. The brothers also jointly own and cultivate 25½ acres of dry-crop land and 6 acres of *bágáyat*, which together are assessed at Rs. 44-8-0.

The sugarcane occupied 1½ acres of the rented field. Chillies were grown on this area in each of the two preceding years. The tenant grew also this year on the same number groundnut, *bájri*, *rála*, *ratálu* and irrigated wheat. The soil is medium black.

The sugarcane was a 12 months' crop planted in April. In the previous November-December the field was heavily folded with sheep. Five hundred sheep were penned on 1½ acres for a month. The shepherd charged Re. 1-9-0 per day for this advantage. During December-January the field was 4 times ploughed

with a heavy plough yoked with 5 pairs of bullocks. Ordinary manure, about 17 loads per acre, was applied after the last ploughing. The field was then apparently ridged with the plough; and beds or water compartments were formed by hand. It is not clear whether whole canes or sets were planted, but 2,720 whole canes were used per acre. These cost Rs. 32. The sets were planted by hand apparently in the ordinary way. After plantation the crop was weeded seven times, and was only watered during 5 consecutive days each month. This could hardly have provided sufficient irrigation except in the rains. The crop certainly did not suffer, for the canes are reported to have been 13 feet long on an average. The experimenter estimates the cost of cultivation and I accept his figures as approximate, excepting cost of irrigation which is much under average. The estimate is otherwise worked out with care and judgment. I cannot accept the valuation of by-product as correct. The green tops which are fed to cattle working the mill and the crushed cane, &c., used as fuel are valued at Rs. 119 per acre. Additional fuel was bought. An iron roller mill worked by 3 relays of 4 bullocks was used to express the juice. The following results were obtained :—

Number of canes per acre	26,888
	Lbs.
Weight of canes per acre	101,060
Do. tops do.	12,373
Do. juice do.	44,380
Do. gul do.	8,998
Percentage juice to cane	43·9
Do. gul to juice	20·9
Do. gul to cane	8·8

The above percentages are much under average. The *gul* was valued at 23 lbs. 19 tolas per rupee—a very cheap rate. At this rate the outturn for an acre, exclusive of the by-product, was worth Rs. 379-10-0.

The estimated cost of cultivation per acre is as under :—

For ordinary labour the following rates are charged : three annas a man, 2 annas a woman and 4 annas for a pair of bullocks. The skilled labour required in gul-making is charged at a higher rate.

	Rs.	a.	p.	Rs.	a.	p.
1. Ploughing 4 times	26	10	8			
2. Manuring—cost of 16 carts, ordinary manure per acre, and folding with sheep	64	9	4			
3. Levelling and preparing beds for planting ...	3	2	8			
4. Cost of sugarcane for sets	32	0	0			
5. Preparing sets and planting	4	6	0			
6. Repairing fence	3	5	4			
7. Weeding, 7 times	17	8	0			
8. Watering once before planting and 5 days per month afterwards	16	4	0			
9. Watching crop	12	0	0			
10. Rent	14	8	2			
11. Baluta	6	10	8			
				201	0	10
12. Harvesting and gul-making—						
Cutting and stripping canes	30	0	0			
Men driving bullocks and working at mill ...	13	12	0			
Fireman and Gulvya	19	14	9			
Hire of mill, pans, &c.	22	12	0			
Oil for mill, &c.	3	3	0			
Extra fuel	10	0	0			
Cloth for Dheps	2	0	0			
Cost of shed	2	10	8			
Hire of bullocks	15	0	0			
				119	4	5
Total expenditure per Acre ...				320	5	3

The probable balance of profit will be as under :—

Value of gul per acre	379	10	0			
Probable value of by-product not utilized during gnl-making	20	0	0			
				399	10	0
Expenditure				320	5	3
Profit per Acre Rs.				79	4	9

SOUTHERN DIVISION.

Belgaum.

Ten experiments have been reported from this district. Each assistant was asked to take two tests on *jowári* and one on *bájri*. Mr. Enthoven sent in three tests on *jowári*. His arrangements for a *bájri* test were upset by wet weather. Mr. Boyd conducted one test on *jowári* and another on *bájri*. Mr. Deshpánde, District Deputy Collector, who was to take two tests on *bájri* and one on *jowári*, submitted five tests on *bájri* alone.

Mr. R. E. Enthoven, Assistant Collector,

Submits three tests, each on kharif *jowári* (*gidjol*). The first field (No. 90) grew *tur* and horse gram subordinate to the *jowári*. The seed of the three crops was mixed before sowing. Therefore the proportionate area under each cannot be determined. The *jowári* only was tested and its outturn is an indefinite proportion of the outturn from the field. This experiment does not therefore give data from which the burden of assessment can be accurately gauged. The outturn of green gram might have been approximately determined by the appearance of this crop, when the *jowári* was harvested. Not so in the case of *tur*. It might have appeared a poor insignificant crop at this time, but with a favourable rabi season the plants may have branched out so that the crop may have subsequently yielded well.

The field tested has poor reddish black soil assessed at Re. 0-11-3 per acre. The land was fairly manured, the season was favourable and the cultivation fair. The outturn, 273 lbs. per acre of grain, classes the crop according to local opinion as an average one. The aggregate value of grain and fodder is only Rs. 5-15-7 per acre. The percentage incidence of assessment works out 11·76.

This experimenter's 2nd and 3rd tests (Nos. 91 and 92) are intended to compare the results of good and bad cultivation on similarly classed land. But the comparison is somewhat invidious, inasmuch as, the principal crop only of each field has been tested. Each field has black soil. One is assessed at Re. 1-4-10 per acre, the other at Re. 1-3-0. The former was unmanured, the latter was heavily manured. The unmanured field naturally produced the worst crop. Moreover the field was weedy. In this field horse gram alone was subordinate to the *jowári*. In the other there was considerable variety in the subordinate mixture. Each field was sown rather late in the season (August). The fodder and useful by-product was valued but not actually weighed. The results from each test are tabulated below for comparison :—

	Anna Estimate.	Outturn of grain per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	Rs. a. p.	
Unmanured field (Exp. No. 91)	16	609	11 9 0	1 4 10	11·26
Manured do. (Exp. No. 92)	20	1,493	27 5 4	1 3 0	4·34

The grain from each crop tested is respectively valued at 57½ lbs., 66 lbs. and 63 lbs. per rupee, which rates even for an outlying district are exceedingly low. The assessments are revision survey rates, and there is evidence that the burden of assessment is light.

Mr. C. C. Boyd, Assistant Collector,

Submits two crop tests (Nos. 93 and 94) one on *jowári*, the other on *bájri*. The fields experimented upon have each red light soil, the productiveness of which depends to a considerable extent upon favourable rainfall. This year there was hardly any rain in the district until August, and the crop experi-

mented upon, which was sown early in July, suffered accordingly. The crops of the vicinity were generally poor. Those tested were average for the year on light soil. The experimenter reports the *jowári* crops of the deep moisture-holding lands of the same táluka to have been very good. *Jowári* yielded better than *bájri*, on the tested fields. The respective outturns were, *jowári* 398 lbs. and *bájri* 274 lbs. of grain per acre. The crops are classed at 14 and 12 annas. I think the latter estimate is high. This fact and the scant early rainfall account for the high incidence of assessment which works out 18·74 per cent. for the latter.

Mr. N. G. Deshpánde, District Deputy Collector,

Submits in all five tests. *Bájri* with *kulthi* subordinate to it was in each case experimented upon. The pulse crop was in each case a comparative failure, and no count was taken of its outturn. The experimenter estimates the outturn of each *bajri* crop at the maximum standard, but it is not at all clear that the anna valuations are right. On the contrary, there is clear evidence to show that the estimates are much too high. The outturns vary considerably. This in part is attributable to the varying quality of the soils of the selected fields. The experimenter's object was apparently to gauge the producing capabilities of fields, the soils of which were locally considered most suitable, less suitable, and least suitable for *bájri*. Two of the fields were manured, three were not. This fact and other circumstances vitiate the desired comparison.

The first field (Exp. No. 95) has mixed red black and calcareous soil, of fair depth. The field slopes and the soil is the detritus from higher levels accumulated on the field by means of embankments which obstruct washing to a still lower level. The upper end of the field is naturally poorer than the lower, and to get an average of the whole two test areas were selected. The soil is classed as very favourable for *bájri*, but it is impossible that it could be so as it varies considerably in depth and character.

The cultivation was inferior. No manure was applied. Weeding was neglected; and *bájri* alone or *bájri* with a subordinate mixture occupied the field in four out of the last five years. The season was not very unfavourable. The rain came late. There was sufficient for sowing. The seed was sown late (3rd or 4th week in August). A long break caused anxiety; but late rains came in time to revive the withering crops of the district and bring them to maturity. The experimenter hazards the opinion that the long break tended to increase the grain produce by checking the luxuriant growth of straw. I am afraid this supposition is erroneous. In any case there are too many deteriorating influences to warrant the experimenter in estimating the crop at the maximum standard, and the same remark applies to all the crops tested by this officer.

The second field (Exp. No. 96) has a thin layer of black soil overlying soft *murum*, and for *bájri*, is locally considered next in quality to that of the first test. The field was level, free from weeds, and was manured fairly by folding sheep. Date of sowing, season and other conditions were like those of the first test.

Each of the next two fields (Exp. Nos. 97 and 98) has a thin layer (5 inches to a foot deep) of red soil overlying *murum*. This description of soil is considered for *bájri* inferior to that of the fields of the first two tests. It forms, however, in the district, the greater portion of the area on which *bájri* is ordinarily grown. The tillage was in each field careful. One field is situate on the top of an eminence and was fairly manured by folding sheep. The other occupies a slope. The lower portion of this field carried the best crop. Test areas in each field were selected to get a fair average. Date of sowing, season and other conditions were identical with those of previous tests.

This officer's fifth test (No. 99) was taken on the higher and poorer portion of a sloping field. Across the lower end of the field an embankment had been formed which helped to accumulate there a deep deposit of red soil. The higher portion has a thin layer of red soil, cut up into hollows by the surface wash caused during heavy rain. The area tested was considered locally the worst description of *bájri* land. The whole field is assessed at Re. 0-10-10 per acre, but the experimenter thinks that the area tested owing to its inferiority could not fairly bear an assessment of more than 2 annas per acre. The results of each test

for convenient comparison are noted below. The valuation of by-product is equally high in all the tests :—

	Anna Estimate	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 95)	20	552	792	12 8 10	11 7	5·76
Second do. (Exp. No. 96) (manured).	20	318	547	7 10 7	7 10	6·39
Third do. (Exp. No. 97)	20	214	492	5 8 5	3 3	3·36
Fourth do. (Exp. No. 98) (manured).	20	218	475	5 10 3	3 9	4·15
Fifth do. (Exp. No. 99)	20	94	182	2 8 3	Say 2 0	4·97

The assessment is according to revision rates. The experimenter concludes that the above figures "show the accuracy of the valuation and the merits of the system of assessment." If I am right in assuming that the anna estimate, in each case, is considerably higher than it ought to be, the above figures show that the burden of assessment is by no means high.

Bija'pur.

The crops which should have been experimented upon in this district were *bájri* and early and late *jowári*. Mr. Batchelor submitted three well reported tests on early *jowári*. Mr. Chuckerbutty only carried out one *bájri* experiment. Mr. Artál reported one *bájri* and two rabi *jowári* tests.

Mr. Lushington was fully occupied with revision settlement work in the Ratnágiri district and was only able to conduct an experiment on niger-seed.

Mr. S. L. Batchelor, Assistant Collector.

This officer sends three careful experiments (Nos. 100—102) all on *jowári*. The reports are concise, yet all information of importance is given. Each field selected has red *masári* land. This soil is unsuitable for cotton and grows *bájri* and *jowári* in alternate years. The assessments of the fields per acre are respectively Re. 0-7-1, Re. 0-7-9 and Re. 0-13-10. The experimenter is unable to say why the latter field bears the higher assessment. As far as he could judge, the soil was the same as in the other fields, and as regards position, &c., neither of the fields had any apparent advantage over the others. The season was favourable for all kharif crops, excepting late sown *bájri* which was completely wrecked by a heavy downpour of rain in November. For seasonably sown kharif crops rainfall was sufficient and timely. The market rates reported for principal and by-products are unusually low. But on reference this was explained to be due to the bountiful harvest of the district. A poorer outturn in a less favourable year need not therefore necessarily mean diminished profits to the cultivator. The first two fields were fairly manured for this year's crop; the third was liberally manured for the crop of the previous year. The cultivation of the first field was fair but the appearance of the other fields bore no evidence of specially careful tillage. Each crop was seasonably sown and the seed rates are about ordinary. The anna valuations I believe to be correct estimates. The crops were harvested on the 17th and 18th of November and give the following results :—

	Anna Estimate	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 100)	17	1,250	3,072	25 8 3	7 1	1·73
Second do. (Exp. No. 101)	16	1,252	3,060	25 4 5	7 9	1·91
Third do. (Exp. No. 102)	16	1,177	3,210	24 7 10	13 10	3·53

The fields were selected as normal for the year. The experimenter says "the incidence, especially in first and second fields, seems very low, but I believe would be confirmed by further experiment on the same crop in these tálukas south of the Krishna."

Mr. A. W. G. Chuckerbutty, Assistant Collector,

Sends one crop test (No. 103) on *bájri* which had subordinate to it *tur* and Italian millet (*navani*). Three rows of *bájri* alternated with a single row of *tur* and again with a single row of *navani*. The *bájri* was alone tested. The actual area under *bájri* can be calculated and the acre outturn therefrom determined; but it is by no means certain that the value of the outturn is even an approximation of that of the whole mixed crop of the field. The information reported is of little or no value in determining whether the burden of assessment is fair or otherwise.

The field has black soil and was heavily manured three years since. The crop was sown a fortnight later than it should have been. Rats damaged slightly the seed or seedlings, soon after sowing. The cultivation is described as good. Presuming that *bájri* occupied the whole field without any admixture, then the outturn, &c,, results are as under :—

	Anna Estimate	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
Experiment No. 103	11	422	687	9 3 11	6 6	4·39

Mr. R. C. Artál, District Deputy Collector.

This officer sends three crop test reports, one on *bájri* and two on late *jowári*. In the *bájri* (Exp. No. 104) there was a sprinkling of *tur*, *ambádi*, sesamum and *rála*. The subordinate crops were practically failures and were not tested. The failure is attributed to a rank growth of grass locally called famine grass or *wanti kasa* which must have also seriously diminished the *bájri* outturn. The experimenter, however, does not admit such to have been the case. The field experimented upon lies within the fort walls of Bijápur and was Government waste prior to 1892. Two arable crops have been taken since. The field was weedy, probably because it has recently been brought under cultivation. The land no doubt gained fertility whilst it was waste and the crop tested probably benefited considerably from this, also from the manure applied this year. The crop is described as average for the district. This may be true, but the conditions of cultivation were not average, and it would have been better if the experimenter had selected a field from those under ordinary cultivation.

This officer's *jowári* tests (Nos. 105 and 106) are more satisfactory. The favourable season influenced the outturns to a greater extent than any other factor. It is not at all likely that the returns would have been so good as those reported oftener than one year in three, and it is questionable whether the anna estimates are not too low. If the crops are correctly estimated, the burden of assessment is extremely light.

The first *jowári* field has red black soil. It is situate on the banks of the Don river and bears an assessment of Re. 0-9-11 per acre. It is 200 yards from the village and is never manured. It grows *jowári* almost every year, and occasionally wheat and gram. This year the field was not ploughed. The heavy harrow was used as a substitute. The seed, 6⅓ lbs. per acre, was drilled in October, and the crop ripened in the end of February. Meantime the rainfall was timely and sufficient. The crop was bullock-hoed twice.

The second field has deep black soil and is situate in the Don valley. It is assessed at Re. 0-11-1 per acre. It occasionally grows cotton. *Jowári* has been grown three years out of four since 1890-91. No manure is ever applied. This year the harrow was used as a substitute for the plough. The seed was sown in September and the crop ripened in February; meantime, as in the other field, the bullock hoe was used twice. The season was very favourable. The results from each field are tabulated below :—

	Anna Estimate	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 105)	16	1,124	2,407	32 3 5	9 11	1·92
Second do. (Exp. No. 106)	14	784	2,110	23 14 3	11 1	2·89

Mr. J. L. Lushington, Divisional Inspector, L. R. and Agriculture, S. D.,

Submits a niger-seed test (No. 107). This crop was grown for the first time, on the better portion of a field with red brown soil, assessed at Re. 0-3-2 per acre. The experimenter thinks that the proportion of assessment exigible from the area under niger-seed should be annas 8 per acre. No manure is ever applied. The field ordinarily grows *jowári* and *bájri* with the ordinary subordinate mixtures. It was once ploughed in the fair season, and subsequently was well worked with the heavy harrow before the rains. The seed, 67 tolas per acre, was drilled late in July. The crop was twice bullock-hoed, once fifteen days after sowing, and again at an interval of a fortnight. The season was favourable. The crop was harvested on the 1st of December, and yielded 195⅓ lbs. seed which classes the crop at 11 annas.

Dharwar.

Only six tests have been received from this district. Mr. Bonus who was to have conducted 3 tests on *rági* submitted two experiments on that crop and chose *tur* for his third test, being unable to find another suitable field under *rági*. Mr. Swift made one experiment, but it was not submitted in time for inclusion. The District Deputy Collector Mr. Kànga was asked to experiment on *bájri*, linseed, sesamum or *rági*. He has submitted 2 tests on *rági* and a third one on linseed.

Mr. A. R. Bonus, Assistant Collector,

Submits two *rági* tests and a third on *tur*. The latter was a subordinate row crop with *jowâri* and green gram. The *rági* tests (Nos. 108 and 109) are intended to show the results of bad farming and no manure as compared with more liberal cultivation. The first field is situate near the top of a slope and has red soil which is assessed at Re. 1-0-4 per acre. The other lies on the level top of a hillock. It also has red soil, but the assessment, Re. 0-6-4, indicates that the soil is inferior to that of the first field. The reports are meagre in details. The season is described as good. The cultivation of the first field was 'indifferent,' that of the second 'good'. No manure was applied to the former, whilst 2⅔ cart-loads per acre was applied to the latter. The ordinary crops taken in each field are *jowári* and *rági*. The crops were each sown seasonably in June. The reported seed rate, 10⅖ lbs. per acre in each case, is high. The first field was ripe in the end of November; the other early in December. The outturn, &c., results are as under:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 108) ...	8	400	1,405	8 7 0	1 0 4	12·09
Second do. (Exp. No. 109) ...	11	721	2,090	15 7 6	0 6 4	2·62

This officer's third test (No. 110) on *tur* clearly shows how misleading it is to attempt to gauge the outturn of a field by testing one of the crops of a mixture. The *tur* was a subordinate crop. It only occupied every eighth row, yet after the other crops were removed, it branched out so much that the experimenter says it was a fine spreading crop, and if the whole area had been sown with *tur* alone, there would perhaps have been five rows, where there were four.

The outturn figures are valuable, not as having any bearing on the burden of assessment, but as showing the per acre yield of *tur*, when subordinate to another crop. The reported seed rate, 21 lbs. per acre, is at least four times as much as would necessarily be required to sow an acre, if the seed was sown by an ordinary drill only in every eighth row. The actual yield of *tur* from an acre was :—

310 lbs. pulse.
330 „ husk and chaff. } worth Rs. 5-14-2.
692 „ stalks.

The field has good black grey dry-crop soil, assessed at Rs. 2-10-9 per acre. No manure was applied.

Mr. R. E. Kánga, District Deputy Collector,

Sends two tests on *rági* and one on linseed. The two former (Nos. 111 and 112) afford useful comparison. Each *rági* field has red soil. One is assessed at Re. 0-12-2 per acre, the other at Re. 0-3-5. Neither crop was manured, but the first field is close to a village and benefits by the sullage, also by the village cattle standing on it after harvest. The result is that the field never requires manure. In this field *tur* and green gram occupied with the *rági* every 6th row ; whilst in the other field *tur* alone occupied every 6th row. The subordinate crops were not tested. In the first field the seed was sown mixed in every 6th row, and therefore it is impossible to apportion the exact area under each crop. In the second test the exact area under *rági* is culculated and the acre outturn therefrom deduced on the supposition that the whole field was under *rági*. But because *tur* was the subordinate crop, the acre outturn calculated as described is almost certain to be an underestimate of the actual yield. The first field appears to be capable of growing *jowári* with subordinate mixtures in rotation with *rági* and subordinate mixtures. The second field grows the coarser millets, *sâva*, *navâni* and *râgi* rotated with each other and each with *tur*, as an auxiliary row crop. The rainfall was hardly sufficient, still the season was fair. The cultivation of each field is described as good. The seed rates, 8 lbs. and 6½ lbs. respectively per acre, are higher than usual. The first field was sown in the second week of July, the other in the last week of June. Each crop ripened in the third week of December. Both could, I think, have borne a higher anna valuation, particularly that of the first field. The percentage incidence of assessment is very light in each case. The outturn, &c., results are tabulated below :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 111) ...	12	1,253	2,228	21 8 4	0 12 2	3·53
Second do. (Exp. No. 112) ...	8	421	1,108	7 10 11	0 3 5	2·77

This officer's linseed test (No. 113) gives no information from which the fairness of the assessment can be judged. The linseed was grown mixed with *jowári* and gram. Two rows of *jowári* alternated with a mixed row of *jowári* and linseed and again with a mixed row of *jowári* and gram. Only the linseed was tested, and it is impossible to estimate accurately the proportionate area under it. If this was possible then there would be no assurance that the acre outturn calculated from such data by any means approximates in value that of the mixed crops of the field. On the contrary there is an absolute certainty that it would not. The actual quantity of linseed sown, as described above, over an acre was 1·7 lbs. and the actual outturn from this seed was 76 lbs. worth Rs. 3-9-7. The field has black soil, and grows cotton, wheat and *jowári*, the latter with subsidiary row crops. No manure was applicd. The season was favourable and the tillage sufficient. The field bears an assessment of Re. 1-3-3 per acre.

Kola'ba.

Experiments on *rági*, *vari*, *gram* and sesamum were called for from this district. Mr. DuBoulay forwarded two tests on *rági* and one each on *vari*, rice and gram; and Mr. Bhángaonkar one test each on *rági*, *vari* and gram.

The Assistant Superintendents of the Konkan Revenue Survey were also called upon to take tests in the neighbourhood of their field operations. They reported their inability to do so as the early crops were all reaped by the time they joined the district and they were working under high pressure when rabi crops were being harvested.

Mr. J. H. DuBoulay, Assistant Collector,

Sends five tests, two on *nágli*, one on *vari*, one on rice and one on gram. The rice test is rejected for reasons given further on. All the other experiments are carefully and fully reported.

The *nágli* tests (Nos. 114 and 115) may be first contrasted. The first field has red *mâl* soil assessed at Re. 0-3-6 per acre, and grew *halvi* or early *nâgli*. The second field is steep *varkas* land with stones. It bears an assessment of Re. 0-2-6, and grew *garvi* or late *nágli*. The revision survey is about to be introduced. On each field *vari* follows *nágli* after a fallow of 4 years. Then the land again relapses to waste. Each crop was grown from transplanted seedlings, raised on rábed seed-beds. Cowdung was one of the auxiliaries of the ráb material used for the first field. The rábing of the seed-bed of this field was superior to that of the second field. The ráb material of the second field consisted of branchwood, coarse grass, fine grass, rubbish and pounded earth. The seed-bed of the first field was ploughed and presumably the field also. The second field and its seed-bed were dug by hand twice. The seed-bed was dug once before and once after sowing the seed in June, and the field in June and again before transplantation in August. The area of seed-bed to acre of transplantation was $3\frac{1}{2}$ gunthas for the first field, 2 gunthas for the second. The former is a larger seed-bed than would necessarily be required. The respective seed rates per acre work out $5\frac{2}{3}$ lbs. and $6\frac{1}{2}$ lbs. These also are high although the formulæ rates are higher. The tillage is described as indifferent, but in what manner it was so is not shown. The season was on the whole favourable although rain was deficient early in the season and again during the last fortnight in October. The crops are respectively estimated locally at 11 and 12 annas. I think the experimenter is right in concluding that the anna estimate of each would have been more correctly entered at 18 annas. There is little *nágli* grown in the experimenter's charge. Both fields were found in the same village, and, on hearsay evidence, Mr. DuBoulay believes them to be average of similar crops in the neighbourhood. The heads of grain only are reaped, the straw is allowed to stand in the field and is grazed by village cattle. The burden of assessment is light even when due allowance is made for the period of fallow. The outturn, &c., results are tabulated below for easy comparison :—

	Anna Estimate.	Outturn of grain per Acre.	Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
	As.	Lbs.	Rs. a. p.	As. p.	
First field (Exp. No. 114) ...	11	1,478	35 14 1	3 6	0·61
Second do. (Exp. No. 115) ...	12	1,115	27 0 11	2 6	0·58

Vari forms the subject of this officer's third test (No. 116). It followed *nâgli* after a four years' fallow, and the outturn indicates that the land might perhaps profitably bear another crop before it is allowed to go back to waste. The crop occupied a portion of the same number as the field in the second *nágli* test. Although the area under *vari* is large (nearly 4 acres), it and its seed-bed were hand-dug twice. The seed was sown in June and the seedlings transplanted in August. The seed rate works out $2\frac{4}{5}$lbs. per acre, and approximately a 5-guntha seed-bed furnished seedlings sufficient for an acre of transplantation. The area of the seed-bed is larger than necessary. The ráb material used consisted of brush wood, coarse grass, fine grass, rubbish and earth. *Vari* straw like that of *nágli* is left unreaped and is considered to have no commercial value as fodder, but if ráb material was not abundant in the neighbourhood it would have a distinct value for ráb purposes. The season was favourable; the tillage indifferent. The crop

was reaped towards the end of October and yielded 812 lbs. of grain per acre, worth Rs. 16-15-0. This, according to local opinion, classes the crop at 16 annas. The percentage incidence of assessment works out 0·91.

I regret having to reject this officer's fourth test, on salt rice. Upto a certain point the experiment was conducted under his personal supervision, but through some misunderstanding, the Kárkún who had assisted Mr. DuBoulay in his other tests measured, weighed and returned the produce to the owner. This is unfortunate as the test was undertaken with the object of estimating the fairness of the burden of assessment on a field the owner of which has a dispute with his tenants as to the amount of rent which should be paid to him as superior holder. The field bears an assessment of Rs. 2-10-6 per acre, and the owner formerly was content with 4 maunds of rice per acre, equivalent at local market rates to Rs. 5-9-7. Now he demands 5 maunds worth Rs. 7. It is not clear whether the tenant or the landlord pays the Government assessment.

Mr. DuBoulay's gram test (No. 117) gives satisfactory results. The crop was a second crop after rice. The field grows rice every year. A second crop is rarely taken. This year the soil retained sufficient moisture after the rice was reaped, to warrant the cultivator in sowing gram. The method of tillage is not reported but the cultivation is reported as indifferent. The seed was broadcasted, and this partially accounts for the exceptionally high seed rate, 91 lbs. per acre. Half this quantity ought to have been sufficient. The seed was sown late in November and the crop reaped early in February. It yielded 759 lbs. of pulse. The by-product is valued at a nominal figure. In rice tracts gram fodder is considered much less valuable than in the Deccan, where the leaves and husk of gram are carefully mixed with the *bhusa* (chaff and straw) of wheat and other cereals. The mixed fodder thus obtained is greedily eaten by all kinds of stock. Last year, several experimenters reported gram fodder to have no value at all. This is entirely wrong. The crop tested was in local opinion a 13-anna one. This estimate is probably low. The gross acre value of outturn amounts to Rs. 23-13-6. The field bears an assessment of Rs. 5-2-7. The tillage and other expenses connected with the cultivation of gram are small, and it may be concluded that although the percentage incidence of assessment calculated on the 2nd crop appears high, yet the margin of profit accruing to the cultivator was considerable; and if the value of the rain crop is added, the gross return for the year would bear to the assessment a ratio very favourable to the occupant.

Mr. K. N. Bhángaonkar, District Deputy Collector,

Conducted three experiments, one on *nágli*, one on *vari* and the third on gram. The *nágli* test (No. 118) affords information of value. As usual the crop was grown from transplanted seedlings raised on a rábed seed-bed. The plot under *nágli* was apparently about 10 gunthas. Twenty-two cattle were tied or folded on this plot during two months. The solid excrement was collected and used as ráb material for a seed-bed which measured 6 gunthas. The other ráb materials used for this area were 40 head-loads of grass and 7 cart-loads of household rubbish; presumbly also pounded earth as usual formed the upper layer. The whole was burnt before the sowing season. On the 6-guntha seed-bed approximately 6½ lbs. of seed was sown. All the seedlings could not have been planted on the area experimented upon. Some may have been sold or used by the occupant elsewhere. The area of seed-bed to acre of transplantation is unknown. The area under *nágli* is only a small portion of a large number, 35 acres 26 gunthas. The soil is *varkas* land and bears an assessment of Rs. 0-2-6 per acre. *Vari* succeeds *nágli* after a fallow of 3 or 4 years. Thus if the whole area is culturable either ⅓ or ⅖ of the whole area is under crop every year. The *vari* taken in the second year is admittedly less profitable than the *nágli* taken in the first. The *nágli* experimented upon was considered above the average of a series of years and is estimated as an 18-anna crop. This may be fairly attributed to the liberal rábing of the seed-bed but perhaps more directly to the fact that the urine of a number of cattle folded on the whole area for two months must have enriched the field to a considerable extent. I am not at all certain therefore that the Collector is right in concluding that without the use of tree loppings an 18-anna crop can be produced in ordinary *varkas* land in a favourable

season and that "where grass, cowdung and household refuse of sorts are available, it appears to be demonstrated that it is unnecessary to skin all the trees and bushes in the neighbourhood of their twigs and branches."

The crop tested yielded 1,973 lbs. grain per acre which with the by-product has a gross value of Rs. 53-8-8. The incidence of assessment works out 0·29, which shows that, notwithstanding the period of fallow, the burden of assessment is light if the whole *varkas* area is capable of cultivation. On this point I have some doubts because the experimenter remarks that rarely more than $\frac{1}{10}$th of any *varkas* field is under cultivation in any one year.

On *varkas* land similarly classed *vari* (Exp. No. 119) also was tested. *Nágli* after a period of fallow was grown in the previous year. The area experimented upon will now again lie waste for 3 years. The crop was grown from transplanted seedlings, but the area of seed-bed to acre of transplantation is unknown. The seed-bed measured 12 gunthas and on this area 10 cart-loads of cowdung, 10 head-loads of coarse gross, 4 head-loads of fine grass, 2 cart-loads of rice husk and presumably as usual an upper layer of earth was burnt before the rains. On this seed-bed approximately $1\frac{2}{3}$ lbs. seed was sown. Ordinarily the seed is much more thickly broadcasted. There is great diversity in the seed rates reported by different officers for *nágli* and *vari*, and careful enquiries should be made in future by experimenters in order to get accurate information. The seedlings were transplanted in July and the crop ripened at the beginning of November. A yield of 527 lbs. of grain and 2,164 lbs. of straw per acre is locally considered a 17-anna outturn in a favourable season. The gross value is Rs. 12-6-0 per acre. The incidence works out 1·26 per cent.

Gram (Exp. No. 120) on a field locally called *Malkhandi* rabi land yielded fairly. The same crop is grown every year but why this should be so is not clear. During the monsoon, rain water is impounded and held until the middle of October in order to prevent the growth of grass and afterwards the moisture is sufficient to mature gram. The field was ploughed early in November and the sowing was completed by the 23rd of that month. The seed was drilled at the rate of 101 lbs. per acre, about $\frac{1}{3}$ of outturn. That quantity was unnecessarily large unless the soil was in rough condition and in poor tilth when the seed was sown. It is reasonable to suppose that it was actually so, in which case a large proportion of the seed would not likely germinate. The by-product as in other rice districts is reported to have no feeding or commercial value. The crop, estimated as a 15-anna one, yielded 353 lbs. pulse, worth Rs. 10-2-11. The field is assessed at Re. 0-12-2 per acre and the percentage incidence indicates that the burden of assessment is fair.

Ratnagiri.

Each officer in this district was asked to conduct two experiments on rice and an equal number on *rági*. The rice tests were duly made, but Messrs. Pánse and Crump found themselves too late in camp for *rági* and substituted experiments on *harik* instead.

The Hon. Mr. G. D. Pánse, Assistant Collector,

Submits three tests—two on rice, and one on *harik*. Voluminous explanatory notes are annexed to the report from which I extract the following information.

Devgad táluka was selected as a suitable district in which to take tests in order to determine whether the Khots have just cause to complain so bitterly as they do as to the lands being heavily assessed. The experimenter concludes from his enquiry that the agitation has not been got up in the interests of the cultivators, who are reported to be willing to pay a higher assessment, "provided they are relieved from the clutches of the Khots". The Collector says "no one ever supposed that the Khots' howl is in the interest of any but themselves."

The experimenter laments, in a strained manner, over the poorness of the district and the poverty of the people. As to the condition of the people he gives distressing details which it is unnecessary to repeat. He concludes that the district is poor because inferior rice and the still more inferior hill millets

are only grown. Good rice, he says, is imported into the district for the well-to-do only. The local rice is generally only used in making bread. The whole rice produce of the district is reported to be taken by the "avaricious Khots or the greedy Sávkárs", and the poor cultivators live on *harik*, *nágli* and *vari*.

On such poor fare they have to work hard in their fields, often knee-deep in water. The necessary tillage is especially irksome, because the work cattle are small and weak on account of the poor fodder. And a very light plough, a most ineffective implement, has necessarily to be employed. Rice cultivation is reported to be more profitable than *varkas*, but on the other hand it is more trying to the health of the cultivators. The foregoing description indicates that the rayat follows his calling under some disadvantageous circumstances, still the conditions are no worse than those common to all tracts of heavy rainfall. I think the worst feature of the district is that the original survey numbers are divided into numerous *pot* numbers, that the occupancies through this subdivision have become extremely small holdings, that the population is congested, and that the condition of the agricultural classes can only be improved if the people emigrate in great numbers. The experimenter's report indicates that there is no tendency of the people to emigrate from the over-populated tálukas of Ratnágiri. Such is, however, not the case as large numbers migrate annually to Bombay to seek employment.

The experimenter reports that the inferior rice of the district is cultivated in two ways. It may be grown from seedlings raised in a rábed seed-bed or the seed previously sprouted may be broadcasted directly on the field. The experimenter says that the latter is easier and less expensive method than the former. He forgets to note that the sowing of sprouted seed is a risky method of cultivation, depending for its success upon favourable moderate rain falling immediately after sowing; and further that the outturn from broadcasted rice is invariably considerably less than that from transplanted rice if each crop is grown otherwise under like conditions. He selected for test not transplanted rice but two crops of broadcasted rice. Moreover on *varkas* land he chose *harik*, the most inferior of the hill-millets, and which is only grown when the soil has become exhausted for *nágli* or *vari*. Therefore, it is reasonable to suppose that the values of the outturns of the tested crops are under the average of the whole crops of the district.

Mr. Pánse estimates the cost of cultivation of each crop tested and attempts to show the margin of profit accruing to the cultivator. The labour, I presume, is, to a considerable extent, home labour as the holdings are small. Last year he reported the average rate of pay, in the Rájápur táluka of the Ratnágiri district, for unskilled labour at 1¼ annas per day for a man. This year he estimates the pay per day for a man at 2½ annas, for a man and a pair of bullocks at 6 annas, and for a woman at 1½ annas. Women were not employed at any of the tillage operations in one field and only to a very limited extent in the other. I think it is certain that the women and older children of a cultivator's family would have been largely employed at weeding and at harvest, and would have done light work as effectively as men paid at a higher rate. I accept the experimenter's estimates of cost of cultivation of the rice crops as approximately correct on the assumption that the tillage operations were done by hired labour and that men were employed for nearly all operations. This, however, is not likely to have been the case. The margin of profit works out for each field as under :—

	Area of field.	Value of Outturn of field.	Assessment.	Cost of cultivation inclusive of Assessment and Local Cess.	Balance of Profit accruing to cultivator.
	A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
First field (Exp. No. 121) ...	0 38¼	22 1 8	1 0 0	11 4 7¾	10 13 0¼
Second do. (Exp. No. 122) ...	1 34¾	49 3 11	14 1 0	33 8 2½	15 11 8½

The occupants being under Dhárekari tenure the Khot only gets the Government assessment and as that is included in the cost of cultivation the cultivator's profit is as shown.

As regards the *harik* test (No. 123) the figures are by no means satisfactory. The crop was decidedly poor. The anna estimate indicates that under more favourable conditions the outturn might have been doubled. As already noted *harik* is the least important crop of a well defined rotation. The same cultivator must have had, this year, growing on the same holding, the more profitable millets, *nágli* and *vari*. That, however, does not explain why the occupant should grow *harik* at a loss, which is the case if the experimenter's figures are accepted as accurate. There is very little margin for the figures to be far wrong. The margin of profit works out as under :—

	Area of field.	Value of Outturn of field.	Assessment.	Cost of cultivation including Assessment and Local Cess.	Balance of Profit.
	Gunthas.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Experiment No. 123.	26	3 1 7	0 2 0	2 10 4	0 7 3

Mr. Pánse says that the Khot's share is half the balance of profit. This cannot be so. The Collector says "Mr. Pánse must have misunderstood the meaning of the Khoti Settlement Officer's decision. The share fixed by him as payable to the Khot is of the gross produce. If for *varkas* lands in the village it is one-half (it is usually $\frac{1}{3}$ or $\frac{1}{4}$) the Khot would take Re. 1-8-9, leaving the occupant in the position of having lost Re. 1-1-6 by his field according to Mr. Pánse's calculations."

In contrasting the rice tests it has to be noted that the first field grows salt rice, the second field a less inferior variety. As both crops were broadcasted, it is not likely that the seed rates respectively 58 and 120 lbs. per acre, are each correct. The latter is decidedly high. Each field grows rice every year. The former bears an assessment of Re. 1-0-9 per acre. It was not manured. The latter field is assessed at Rs. 7-8-4 per acre, and was manured with cowdung and ashes of burnt leaves mixed together before application, 31 head-loads of cowdung and the ashes of 51 bundles of dry leaves being applied per acre. The outturn, &c., figures are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 121).	12	909	2,986	23 1 10	1 0 9	4·52
Second do. (Exp. No. 122).	12	830	6,282	26 5 3	7 8 4	28·56

The assessment of the second field indicates that the soil is superior rice land calculated to give its best results, when a transplanted crop is grown, the seedlings being grown on a properly rábed seed-bed. I therefore do not attach much importance to the percentage incidence of assessment working out so high, the more particularly so as the experimenter's calculations indicate that a fair margin of profit is left to the occupant.

The *harik* crop was grown on *bharad varkas* land assessed at Re. 0-3-1 per acre. It was the third crop taken since the land lay fallow. The usual rotation is *nágli*, *vari*, *harik*, *til* and then 3 years' fallow. Season and tillage are described as fair. The seed rate, 39 lbs. per acre, is much too high and cannot be accepted as accurate. An outturn of 388 lbs. of grain classes the crop as a 10-anna one. The by-product, 1,567 lbs. of straw per acre, is held to have no value. This of course is wrong. The straw has little or no value as fodder,

but it is useful for ráb purposes and in other ways. The grain was only worth Rs. 4-12-4 per acre. The percentage incidence of assessment works out 4·04.

Mr. L. C. Crump, Assistant Collector,

Submits two tests on rice, and two on *harik*. The experimenter explains that owing to rains it is almost impossible to visit the northern tálukas of his charge in October, and the rice harvest was almost over before he got into camp. The rice crops of the better fields ripen last; therefore probably the crops tested were over average for the district. The field (Exp. No. 124) first tested has soil of ordinary character. It bears a slightly higher assessment than the second field, but the latter is believed locally to be the better of the two. The second field (Exp. No. 125) is favourably situated on a flat at the bottom of a hill, and receives the washings of higher levels, the accumulation of which during the last 20 years may have changed the character of the field considerably since the assessment was fixed. For each field a 10-guntha seed-bed for an acre of transplantation was required. Smaller seed-beds might have sufficed. On the 10-guntha seed-bed for each field, 30 head-loads of cowdung and 40 head-loads of grass were burnt as ráb in March—April. No manure was applied directly to the fields. The fields grew rice every year. No after-crops are ever taken. The seed rate, 72 lbs. per acre, of each rice field is the same. The seedlings were ready for transplantation in July, and the crops ripened early in November. Season and tillage were each fair. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 124) ...	16	1,772	4,160	53 13 4	9 3 8	17·14
Second do. (Exp. No. 125) ...	16	2,133	5,214	64 15 6	8 1 11	12·49

In each field approximately one-fourth of the gross value is credited to the straw, and I think the value of the by-product is high. On reference the experimenter did not admit such to be the case.

The *harik* tests (Nos. 126 and 127) were conducted on *bharad varkas* fields, one assessed at Re. 0-2-9, the other at annas 2 per acre. Each field lies fallow at intervals for a considerable period—the first field for 5 years and the second for 8 years between each period of cropping. The first field is fairly flat, the second very steep and stony. It is reported that in each field paddy takes a place in the rotation; but this could hardly be possible on the second field. In the first *harik* was the crop of the third year since the land was waste. In the second field it was the second crop taken. The previous crops taken were *nágli* followed by *nágli* in the first field and *nágli* in the second field. The fields were rábed with cowdung, branch-wood, and grass for the *nágli* crop but no manure was applied for the *harik*. The experimenter correctly estimates this crop, as the poorest of the rotation. In the first field, season and tillage was each good; in the second, season good, tillage fair. The seed rate, 37 lbs. per acre, was the same in each field. The rate is high. On reference, the experimenter explained that steep stony *varkas* land requires a higher seed rate than superior *varkas*. This would indicate that there should have been a difference between the seed rates of the tested fields. The seed for each crop was broadcasted in June, and the crops were harvested in the middle of November. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 126) ...	17	942	1,350	14 9 7	0 2 9	1·17
Second do. (Exp. No. 127) ...	17	458	800	7 4 1	0 2 0	1·72

Mr. S. S. Kamlápurkar, District Deputy Collector,

Conducted 4 careful tests, two on rice and two on *nágli*. The rice crops (Exp. Nos. 128 and 129) were each grown from broadcasted seed, which for the first field was artificially sprouted before sowing. The method adopted for germinating the seed is as follows :—The grain is put in a basket and soaked with cold water. Afterwards boiling water is poured over it, and then leaves and grass are spread over the seed and weighted down with a stone. Each day sufficient cold water is added to keep the seed sufficiently moist. In three days the seed germinates and is ready for sowing. In each field rice is grown every year. The first field has red soil. The surface slopes slightly. It bears an assessment of Rs. 5-12-7 per acre. *Vánksál*, a fine variety, was sown. The field was not rábed, but 60 head-loads of refuse manure were applied per acre in May, and 60 head-loads of cowdung per acre at time of sowing. The field was ploughed 6 times before the soil was worked into that consistence of mud necessary for sowing. It was not weeded, and the cultivation is described as indifferent. The owner of the field is a Brahman who hired labour for its cultivation. On half the field, *váingan, i.e.* hot weather irrigated rice, is grown annually. The second field has brown alluvial soil. The assessment is Rs. 4-0-6 per acre. It lies low, and benefits by washings from higher levels. The superior holder is a Brahman. He let the field to a Kunbi for Rs. 18, the Government assessment being Rs. 13. The whole field was rábed by the tenant with 30 head-loads of cowdung, 40 bundles of grass, and 30 head-loads of leaves per acre. A coarse variety of rice was grown. The field was ploughed in May, and the clods crushed. The seed was broadcasted about the end of May, when there were signs of rain. In July the crop was hand-weeded. The season is described as fair and the tillage good. The seed rates, 67 lbs. and 68 lbs. for each field, respectively, are about average. Each crop ripened about the beginning of November. The outturn, &c., results are as under :—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 128) ...	12	1,170	2,250	42 0 6	5 12 7	13.76
Second do. (Exp. No. 129) ...	14	1,542	4,000	57 8 0	4 0 6	7·01

The value of the by-product in each case is decidedly high. At the market rates quoted, the acre values of the straw, &c., of each crop are Rs. 7 and Rs. 12-8-0. The percentage incidence of assessment of the first field is rather high. But if the value of the second crop taken be added to that of the rain crop, the incidence figure would be reduced considerably.

The *nágli* crops tested by this officer (Exp. Nos. 130 and 131) each yielded well considering the character of the cultivation. The soil of each field is described as red and sandy. One field bears an assessment of Re. 1-0-1 per acre, the other an assessment of annas 4. Each field slopes and is situate on the bank of a *nála*. The crops were raised from transplanted seedlings, which were grown on rábed seed-beds having better soils than those of the fields. A good many seedlings were washed away by heavy rain. Making no allowance for this, a 12-guntha seed-bed was required for the former and $14\frac{2}{3}$-guntha seed-bed for the latter per acre of transplantation. Under favourable conditions half of these areas would have sufficed.

The rább material for the first field (6-guntha seed-bed) was 25 loads dried cowdung, 30 loads branch-wood, 20 loads grass, 5 loads of *harik* straw, and a quantity of fine earth. For the second field the same rább was used on $7\frac{1}{3}$ gunthas. The fields are not ploughed for the reason that if stirred and loosened the soil is swept away by rain. The grass, &c., which springs up is reaped and removed 2 or 3 days before the seedlings are transplanted in July. The seedlings are planted in holes made 3 or 4 inches apart with a sharp pointed piece of bamboo. A portion of the second field suffered from blight, but test areas were chosen to

get a fair average of the whole crop. The season for each crop was favourable. The tillage of the first field is described as good, of the second indifferent, which means presumably that one field was weeded more carefully than the other. Each crop ripened at the middle of November. I tabulate the outturn, &c., results from each field below; but it should be understood that the yields would not bear comparison with that of the same crop grown on ordinary *varkas* land, the conditions of soil, &c., being entirely different:—

	Anna Estimate.	Outturn per Acre.		Value of Outturn.	Assessment per Acre.	Percentage incidence of Assessment.
		Grain.	Straw.			
	As.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
First field (Exp. No. 130) ...	14	1,275	1,050	34 8 10	1 0 1	2·93
Second do. (Exp. No. 131) ...	12	996	1,100	27 10 3	0 4 0	0·90

The by-products in each case are valued rather high. The first field is classed as rabi land, and the experimenter suggests that if a rabi crop had been grown, and if the field had been tilled in the manner necessary for a rabi crop, the outturn would have been worth more and the percentage incidence of assessment less. I doubt this. I think the owner probably cultivates in the manner which pays him best.

Ka'nara.

One experiment each on *rági*, on early and on late rice were directed to be carried out in this district. But owing to Mr. Divátia's absence on privilege leave and orders about the transfer of Mr. Hudson no tests could be taken on *rági*. Mr. McNeill who succeeded Mr. Hudson was prevented from testing late rice owing to his absence with a Survey Party.

Mr. N. B. Divátia, Assistant Collector,

Submits two tests, one on early rice, the second on *vaingan* or hot weather irrigated rice. Both reports are carefully drawn up, and the latter affords especially useful information. The field growing the early rice (Exp. No. 132) was one in Sungsál, a ghát village of the Ankola táluka. There were a large number of fields to select from, and the experimenter believes the crop to have been an average one for the district. The soil is dark brown and bears an assessment of Rs. 2-12-3 per acre. The field grows rice every year, but no second crop. A light dressing of manure was given to the field and a much heavier dressing to the seed-bed. The manure consisted of cowdung and green forest leaves fermented together. This compost with dry leaves was applied to the seed-bed before sowing, and to the field during the tillage before transplantation. A 9-guntha seed-bed (approximately) furnished seedlings sufficient for an acre of transplantation. On a seed-bed of this size 15⅓ lbs. of seed was broadcasted. The seed-bed was larger than should have been necessary for the quantity of seed. The seed was sown in the end of June or the beginning of July, and the seedlings were transplanted in August. The crop ripened early in December. Season and cultivation are each described as good. The crop yielded per acre 2,745 lbs. grain and 6,353 lbs. straw, worth together Rs. 74-1-7. This outturn is, I think, considerably under-rated at 12 annas. The percentage incidence of assessment is decidedly light. The experimenter refers to the lightness of the burden of assessment as indicated by the results of this test, as compared with the high incidence of assessment, as shown by his rice test taken in the Kárwár táluka, in the same charge last year. I find that although the incidence of assessment was high, 16·96 per cent. in last year's test, still it was partially accounted for by excessive late rains which damaged the crop and by indifferent cultivation. The experimenter thinks that the wide difference in the incidence of the two tests points to there being some truth in the general complaint of the people that the Kárwár táluka has been rather heavily assessed. If he believes such to be the case, a more reliable comparison could

have been made if he had selected for test in the same year an average rice crop of the Kárwár táluka and an average rice crop of the ghát villages of his charge. The rice cultivators of the ghát villages of his charge are apparently satisfied with the assessment, and so they well may be, if a 12-anna rice crop, cultivated in a very ordinary manner, is, on an average, worth Rs. 74 per acre.

The *vaingan* rice (Exp. No. 133) tested by this officer occupied 4 acres of a rice field, the whole area of which is 7 acres 27 gunthas. The field has light brown soil, with an admixture of sand and is assessed at Rs. 5-3-11 per acre. The whole field grows annually early rice, and the portion under test a second crop of hot weather irrigated rice. The irrigation water is obtained from a *nála*, which flows along the boundary of the field. Sometimes the water does not suffice, because other cultivators take for their fields situate up stream as much as they want, and what is left is taken by the field under experiment. The owner is a Kárwár pleader, who, at a cost of Rs. 2,000 to Rs. 3,000, incurred two or three years since, bunded back the salt water of the Belikeri creek. Previously the field was liable to injurious inundation by salt water. Both the rain crop and the *vaingan* rice crop are directly manured. The latter crop requires twice or at least 1½ times the quantity of manure applied to the rain crop. Each crop is grown from broadcasted seed, the hot weather crop requiring much the largest seed rate. The manure used for the tested crop consisted of cowdung dead and green forest leaves, composted together and mixed before application with paddy husk. The husk was used to keep the soil loose and open. About 5 tons per acre of the mixed manure was applied, and with it nearly 2 tons per acre of fish and ashes. The proportion of fish to ashes is not reported. It is not quite clear whether the irrigation water was sufficient this year. The season and tillage are described as good. The crop was sown in January and ripened in May. The outturn is classed at 10 to 12 annas. The yields of grain and straw are respectively, per acre, 977 lbs. and 2,417 lbs., worth Rs. 32-5-1. The incidence works out 16·23 per cent. The Collector in commenting on the test in his forwarding remarks thinks that it may safely be assumed that, if the rain crop is taken into account, the assessment does not amount to more than 8 per cent. of the gross produce. He says further that "very much of the land in Kánara has been made culturable at very great expense, and the interest on this capital as well as the heavy expenditure on manure have all to be taken into consideration, and comparison of assessment here with that of dry-crop land elsewhere, which has cost nothing to bring into cultivation, and on which the annual ploughing and sowing are the only expenses is entirely fallacious." The Collector wishes to draw special attention to the above remarks, because the Kánara settlements are coming up for revision.

Mr. C. W. M. Hudson, Assistant Collector.

This officer's rice test (No. 134) was taken in Kárwár, a táluka which, according to the report of the last experimenter, is considered by the cultivators to be highly assessed. The results of this test do not bear out the contention. The field selected for experiment is one favourably situated. It grows not only rice as a rain crop, but, at least half its area grows a second pulse crop annually. The field is situate half a mile from the sea. The soil is very sandy. It benefits from the wash of hills to the south. The assessment is Rs. 5-5-1 per acre. The rainfall of the year was sufficient, but not always seasonable. The rainfall at the end of the season no doubt was beneficial to the rabi crop. The late crop is lightly manured with ashes of burnt chaff and firewood, and the rice crop, with 160 head-loads per acre of a compost manure consisting of dry leaves, firewood ashes, stable litter, and cowdung. The rice is always grown from broadcasted seed. The seed rate reported, 229 lbs. per acre, is abnormally high. A reference on this point confirmed the seed rate as correct. The crop was sown early in June, and ripened in the 3rd week of October. It yielded per acre 2,328 lbs. grain and 2,750 lbs. straw, together worth Rs. 63-5-2. This outturn is estimated at 15 annas. The incidence works out 8·39 per cent. The expenses connected with the cultivation of the crop could not have been nearly so large as those of transplanted rice, and I think that it is certain that the balance of profit left to the occupant was considerable.

Mr. J. McNeill, Assistant Collector,

Sends one test on rice which is not satisfactory. I regret I cannot report it. The outturn figures are, I think, calculated on weighments of the undried grain produce of the test areas. The experimenter is unable to say how many days elapsed after harvest before the grain was weighed. The presumption is that it was not thoroughly dry, because the contents of a ser measure weighed 96 tolas at date of experiment and 78 tolas 5 months afterwards. The latter weight was obtained not by actually weighing the contents of a ser, but by taking half the weight of a sample which exactly filled two sers at date of experiment. There is no guarantee that the loss in weight may not have in part been due to the loss or removal of grain from the parcel during the period it was kept in Mr. McNeill's office. The loss in any case is too much to be accounted for by dryage. Assuming 96 tolas per ser to be the correct weight, the outturn of grain works out 2,550 lbs. per acre; whilst if 78 tolas per ser is right, the yield of grain is only 2,080 lbs. per acre. Mr. McNeill explains that he did not forward his experiment report with the sample at the date of his experiment, because he expected to be able to take a test on late rice and intended to send both reports together. He was prevented from making the intended experiment owing to absence on Survey duty.

J. W. MOLLISON, M.R.A.C.,
Superintendent of Farms,
Bombay Presidency.

Kirkee,
19th October 1894.

TABULAR SUMMARIES.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	AHMADABAD.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. G. S. Curtis, Assistant Collector.									
1	Daskrohi (Asláli) ...	Barley (Jav), 5th March 1894.	10 to 11	940 to 1,030	246	795	205	16 12 0	5 2 0 R. S.	30·59
2	Do. (Nadicha) ...	Do. (do.) 17th March 1894.	11	1,030	143	1,124	410	24 6 7	3 13 0 R. S.	15·61
3	Do. (Badodra) ...	Gram, 18th March 1894.	16	675	184	1,241	...	28 5 9	3 0 11 R. S.	10·78
	Mr. J. K. N. Kábráji, Assistant Collector.									
4	Viramgam (Odhav) ...	Wheat (Kátha), 7th March 1894.	16	825	55	631	...	16 5 3	0 14 4 R. S.	5·48
5	Do. (do.) ...	Do. (do.) ...	16	825	76	328	...	8 7 10	1 6 4 R. S.	16·44
6	Do. (Sitápur) ...	Wheat (Kátha), 11th March 1894.	14	720	49	682	...	17 10 8	1 3 2 R. S.	6·78
	Mr. Motilál Chunilál, District Deputy Collector.									
7	Sánand (Ghuma) ...	Gram, 9th February 1894.	8	320	47½	615	...	11 4 0	3 7 8 R. S.	30·92
8	Dholka (Simej) ...	Do. 20th February 1894.	10	375	10¼	1,790	...	32 11 9	2 0 0 R. S.	6·11
9	Sánand (Navápara) ...	Sugarcane (white), 13th February 1894.	16	4,060	1,125 whole canes.	7,736 gul.	16,820	901 0 6	3 6 0 R. S.	0·38

Northern Division, 1893-94.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 4	40 (weight ser)	51¼	1½	*Experiment No. 1.*—Irrigated barley, a second crop after rice, on good garden land manured for the first crop with about 6 cwts. of castor cake per acre. The field grows rice every year followed by barley, except when the moisture is insufficient for the second crop. The crop was irrigated from a well, but the extent of irrigation is unknown. Tillage good. Crop suffered a good deal from rust. Seed rate very high. Crop 8 annas according to the formulæ. Incidence on the second crop alone.
0 4	Do.	Do.	Do.	*Experiment No. 2.*—Same crop on similar land assessed at a lower rate. Field manured with 9 carts per acre of ordinary manure. Rotation undefined:—(1) *juvár*, (2) rice and barley, (3) *bájri* and barley, (4) barley; and this year *juvár* followed by barley. Season, &c., as above. Incidence on the second crop alone.
0 4	Do.	43¾	...	*Experiment No. 3.*—Gram as a sole crop on *gorádu* soil, growing gram alone in each of the last two years, but previously rain crops. Season favourable but tillage indifferent. Seed rate 6 times that given in the formulæ and the outturn nearly double the same standard. By-product given to cattle, but not valued. Area of test below the prescribed minimum.
0 8	Do.	38⅗	...	*Experiment No. 4.*—Dry wheat, *kátha*, on unmanured black land somewhat salt. Field generally grows *vari* every year. The usual crop failed this year, and wheat was sown afterwards. Season favourable and tillage good. Crop 13 annas according to the formulæ. By-product neither valued nor weighed in this and the following two tests.
0 8	Do.	Do.	...	*Experiment No. 5.*—Same crop on black land impregnated with more salt. Field cultivated under precisely the same conditions. Season, &c., as above. Crop only 6 annas of the formulæ, though estimated at 16 annas.
0 10	Do.	Do.	...	*Experiment No. 6.*—Same crop on unmanured black land growing wheat and cotton in turn, unless the season be exceptionally unfavourable for cotton. This year cotton was spoilt by late heavy rains and wheat took its place. Season, &c., as above.
0 8	Do.	54⅔	...	*Experiment No. 7.*—Gram, a second crop after *vari*, on *kiári* land manured for the first crop with about 12 carts of cattle dung per acre. Deshi cotton and wheat grown during the previous year. Season good and tillage careful. Crop 16 annas according to the formulæ. Incidence on the second crop only.
0 8	Do.	Do.	...	*Experiment No. 8.*—Same crop on unmanured dry crop land which grew the same crop in the previous year, but previously lay fallow for four years. Sesamum had been sown early in the season, but was washed away by heavy rains, and gram substituted in its place. Seed rate very low. Season favourable; and tillage good. Outturn more than double the maximum standard of the formulæ.
0 8	Do.	9 1/10	5⅖	*Experiment No. 9.*—Sugarcane, white, on land classed as *jiráyat*, but irrigable from a well. Field left fallow last year and grew deshi cotton in the previous year. The land manured by folding goats for a month; then camels kept on it for a season; afterwards 40 carts per acre of cattle dung spread on the land, and a top-dressing of castor cake given to prevent white ants. Crop irrigated by *mot* from a well. Season good and tillage careful. Seed rate low. *Gul* valued very high in both this and the following tests.

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	AHMADABAD—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Motilál Chunilál, District Deputy Collector—continued.									
10	Dholka (Maflipar) ...	Sugarcane (black), 22nd February 1894.	4	1,250	1,330 Whole canes.	4,738 gul.	13,350	561 11 6	2 8 7 R. S.	0·45
	KAIRA.									
	Mr. J. DeC. Atkins, Assistant Collector.									
11	Thásra (Sanádra) ...	Gram, 23rd February 1894.	...	...	59	400	...	9 1 2	3 11 3 O. S.	40·81
	Mr. Sorábsha Hormasji, District Deputy Collector.									
12	Mehmadabad (Virol) ...	Spiked millet (bájri), 15th October 1893.	18	1,050	17	458	2,120 kadbi, 237 chaff.	16 6 5	3 5 4 O. S.	26·87
13	Mehmadabad (Kaira) ...	Do. (do.) 16th October 1893.	8	450	11⅓	185	1,143 kadbi, 220 chaff.	7 3 3	4 10 8 O. S.	64·79
14	Do. (do.) ...	Do. (do.) 21st October 1893.	16	900	19	621	2,117 kadbi, 337 chaff.	20 12 6	6 0 9 O. S.	29·09
	PANCH MAHÁLS.									
	Mr. E. Maconochie, Assistant Collector.									
15	Godhra (Godhra) ...	Do. (do.) 26th October 1893.	10	515	41	538	1,972	18 8 6	0 15 2 O. S.	5·11
16	Do. (Wawdi Bujrag).	Do. (do.) 31st October 1893.	10	515	23	277	1,228	10 2 10	1 1 9 O. S.	10·90

Northern Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 8	40 (weightser.)	9 1/10	5 5/7	*Experiment No. 10.*—Hard black sugarcane on land classed as *jiráyat* but irrigated from a well and growing irrigated crops of wheat, chillies, brinjals and sugarcane. Field manured with 60 carts per acre of cattle dung and crop top-dressed with castor cake. Season good; and tillage fair. The yield much underestimated at 4 annas.
0 27	Do.	44	...	*Experiment No. 11.*—Unmanured and unirrigated gram on black soil growing continuous rice which was this year manured liberally. A second crop taken only when season favourable. Tillage average. Seed rate high. The anna estimate not furnished by the experimenter, but the yield represents a 10-anna crop according to the formulæ. Incidence on the second crop alone.
0 12	Do.	35 1/2	6 kadbi, 6 5/7 chaff.	*Experiment No. 12.—Bájri* with subordinate pulses on *goráḍu* soil manured with 9 cart-loads of farmyard manure per acre. Rotation :—*bájri* with pulses for two years followed by *bájri* and *kodra* in the third. Season favourable and tillage good. Seed rate double the average and the outturn, exclusive of the subordinate pulses which are reported to be good, represents an 8-anna crop of the formulæ.
0 12	Do.	Do.	6 kadbi, 6 2/7 chaff.	*Experiment No. 13.*—Same crop on slightly higher assessed land manured with 7 carts per acre of farmyard manure. Rotation :—*juvár* in 1890 and *bájri* with mixtures since then. Tillage bad. Yield, exclusive as above of the subordinate pulses, not more than 3 annas of the formulæ.
0 8	Do.	Do.	6 5/7 kadbi, 6 2/7 chaff.	*Experiment No. 14.—Bájri* alone on *goráḍu* soil manured with 9 carts of ordinary manure per acre and growing during the previous three years (1) *bájri*, (2) *bávto* and tobacco, and (3) *bájri*. Seed rate more than double the formulæ and the outturn 11 annas according to the same standard. Incidence very high.
0 10	Do.	39	3 1/7	*Experiment No. 15.—Bájri*, with subordinate pulses, on inferior *goráḍu* soil manured with 8 1/3 carts of ordinary manure per acre and growing *bájri* and *bávto* in alternate years. Heavy rain in June washed away the first sown seed and the land had to be sown again. The season fair; and tillage good. Outturn exclusive of the pulses which were not tested. Seed rate, though representing the quantity of two sowings, somewhat high, being double the formulæ standard (10 lbs.).
0 10	Do.	Do.	Do.	*Experiment No. 16.*—Same crop on similar soil manured in the previous year with about 7 carts of farm-yard manure per acre. No fixed rotation. Field grows *bájri*, *banti* or *bávto*. Season, &c., as above. The outturn, leaving out of consideration the subordinate pulses, less than 6 annas according to the formulæ.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	PANCH MAHÁLS—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Pránlál Harkisandás, District Deputy Collector.									
17	Dohad (Nalvai) ...	Elusine coracana (Rági or Bávto), 13th November 1893.	8	675	5	451	1,715	7 6 7	0 12 5 R. S.	10·47
18	Do. (Tuki-Vajn) ...	Do. (do.) ...	14	1,180	6¾	1,050	2,823	16 15 0	1 12 9 R. S.	10·60
19	Do. (Nádva) ...	Do. (do.) 14th November 1893.	17	1,460	6⅓	1,272	2,954	20 1 4	1 2 11 R. S.	5·88
20	Do. (Tuki Anop) ...	Do. (do.) ...	12	1,015	6	919	2,539	15 1 0	1 5 9 R. S.	9·02
21	Do. (Dohad) ...	Sesamum (Til), 1st December 1893.	8	245	25	107 Seed.	353	5 12 6	1 7 5 R. S.	25·31
22	Do. (Pusri)	Do. (do.) ...	8	245	19	111 Do.	357	5 15 10	1 9 9 R. S.	26·89
23	Do. (Kharedi) ...	Do. (do.) 3rd December 1893.	8	245	22	131 Do.	382	7 0 5	1 4 5 R. S.	18·16
	BROACH.									
	Mr. E. H. E. Leggatt, Assistant Collector.									
24	Broach (Bholáo) ...	Rice, 23rd October 1893.	13	915	51⅓	372 in husk	...	10 2 11	19 8 0 O. S.	191·51
25	Do. (Borbhátha) ...	Spiked millet (Bájri), 27th October 1893.	16	975	4	308	...	12 5 6	11 3 1 O. S.	90·67
26	Ámod (Rohodh) ...	Sesamum (Til), 13th January 1894.	16	600	¾	155 Seed.	720	14 8 6	7 2 3 O. S.	49·14

Northern Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 10	40 (weight ser)	70⅓	15⅔	*Experiment No. 17.*—*Rági* on unmanured light brown, *gorádu*, soil growing only one crop in a year. Rotation undefined, *kodra* and niger seed having preceded *rági*. Season not quite favourable to the light land on which the test taken. 1¼ gunthas of seed-bed stated to have furnished seedlings for an acre of field. Tillage bad. Crop not more than 5 annas of the formulæ.
0 10	Do.	Do.	12⅔	*Experiment No. 18.*—Do. on better *gorádu* soil manured with 5 carts per acre of ordinary manure. Field grew maize followed by gram during each of the last three years. Season favourable and tillage good. 1⅔ gunthas of seed-bed sufficed per acre of plantation.
0 10	Do.	Do.	13 3/16	*Experiment No. 19.*—Do. on similar land equally manured. Rotation undefined. A pulse crop raised in each of the previous three years. 1 1/16 gunthas of seed-bed gave seedlings for an acre of plantation.
0 10	Do.	Do.	11⅔	*Experiment No. 20.*—Do. on similar land. Rotation undefined, but much the same as above. Seedlings from 1½ gunthas sufficient for an acre of transplantation.
0 10	Do.	19⅓	12⅔	*Experiment No. 21.*—Sesamum on land classed as *gorádu* which lay waste for the last three years. Season unfavourable and cultivation indifferent. Seed rate very high; outturn less than 4 annas according to the formulæ standard. Incidence high.
0 10	Do.	Do.	12⅔	*Experiment No. 22.*— Do. do. do.
0 10	Do.	Do.	13⅔	*Experiment No. 23.*— Do. do. do. Last year the same crop raised after two years' fallow. Other conditions as above.
0 8	Do.	36	...	*Experiment No. 24.*—Rice in alternate rows with cotton and *tur* on heavily assessed unmanured black soil. Rotation :—(1) rice, *tur* and cotton, (2) *tur*, (3) rice and cotton, and (4) fallow. Season fair and field free from weeds. Yield actual outturn from an acre. Cotton will bear the bulk of the assessment. By-product neither weighed nor valued.
0 8	Do.	31	...	*Experiment No. 25.*—*Bájri* mixed with pulses on rich black soil growing without manure the same mixture in alternate years with *juvár*. Season fair and tillage good. The outturn is exclusive of the subordinate pulses which were not tested. By-product not weighed, but valued at Rs. 2-8-0 per acre.
0 8	Do.	11⅔	5 1/7	*Experiment No. 26.*—Sesamum on good black unmanured land growing cotton every other year in rotation with wheat or sesamum. Season, &c., as above. Crop only 4 annas according to the formulæ. The oil-seed valued very high. Incidence high, but cotton in Broach bears the greater portion of the assessment.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	BROACH—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Phirozsháh Pestanji, District Deputy Collector.									
27	Ankleshvar (Chorási) ...	Rice (Sária), 31st October 1893	18	1,750	57½	2,664 in husk	3,230	62 2 5	11 4 0 O. S.	18·10
28	Do. (Kasba) ...	Spiked millet (Bájri), 31st October 1893.	14	1,050	3	800	1,750	27 14 1	8 13 4 O. S.	31·68
29	Do. (Obha) ...	Wheat (Hánsia), 20th February 1894.	16	1,055	60	844	1,056	34 1 0	4 0 5 O. S.	11·81
	SURAT.									
	Mr. W. Doderet, Assistant Collector.									
30	Balsár (Balsár) ...	Rice (Kada), 15th October 1893.	15	2,110	229	2,094 in husk	2,531	51 3 10	14 3 5 O. S.	27·74
31	Do. (Do.) ...	Do. (do.) ...	18	2,625	181	2,698 Do.	3,773	63 1 3	9 9 11 O. S.	15·25
32	Do. (Do.) ...	Do. (do.) ...	20	3,000	153	2,629 Do.	3,553	57 14 4	23 0 9 O. S.	39·80
33	Jaláipor (Mansád) ...	Sugarcane (Malbári and Vánsi mixed), 14th and 15th December 1893.	17	5,690	21,600 sets.	5,712 gul.	7,080 tops.; 1,400 bundles leaves.	268 4 0	15 10 8 O. S.	5·83

Northern Division, 1893-94—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	40 (weight ser.)	44¾	11	*Experiment No. 27.*—Rice, *Sária*, on deep black soil growing during the past three years (1) rice, *láng* and castors, (2) rice and *láng* and (3) cotton. Field manured with 19 carts of cattle dung per acre and the seed-bed, 6¼ gunthas for an acre of plantation, with 5 carts of the same manure. The crop irrigated by water deviated from a road-side channel fed by a large but shallow creek. Rain deficient at end of the monsoon, but season favourable on the whole. Cultivation excellent. Seed rate high. Outturn 1½ times the formulæ standard.
0 8	Do.	29⅘	14⅔	*Experiment No. 28.*—*Bájri* alone on good black soil manured in the previous year. *Bájri* rotated with garden crops, garlic, tobacco, sugarcane, &c. Season as above and tillage careful, though the crop damaged to some extent by birds. Seed rate very low and outturn less than 11 annas according to the formulæ. The garden crops bear the greater portion of the assessment.
0 16	Do.	27⅛	2$\frac{13}{14}$	*Experiment No. 29.*—Dry-crop wheat, *Hansia*, on good black soil, dressed with 14 carts per acre of cattle dung. Wheat and cotton taken in turn. Season not quite favourable, the late rains being deficient. Tillage excellent. Outturn less than 14 annas of the formulæ.
0 4	37½ (weight ser.)	43	9	*Experiment No. 30.*—Unirrigated rice, *Kada*, on good black soil manured with 30 cart loads per acre of cattle dung and growing rice continuously followed by *láng* for which water is drained from a neighbouring marsh. September rain somewhat deficient, but tillage good. Area seed-bed to acre of plantation reported at 3⅓ gunthas. Seed rate very high, 30 lbs. being the formulæ standard. Incidence on the first crop alone.
0 4	Do.	45	10⅝	*Experiment No. 31.*—Same crop on similar soil, but bearing a somewhat lower assessment. Field manured with 26 cart loads per acre of cattle manure. Rice grown every year and followed by *vál* only when land sufficiently moist. Season, &c., as above. 7·4 guntha seed-bed per acre of transplantation. Seed rate lower than in the test above, but still very high.
0 4	Do.	48	10¼	*Experiment No. 32.*—Same crop on very highly assessed black soil dressed very liberally with 80 cart loads of cattle dung per acre. Field grows rice followed by *vál* every year. Field irrigated from an adjoining tank and did not suffer for want of September rains as the crop in the above tests did. Cultivation good, though the field slightly weedy. Area of seed-bed per acre of plantation reported at 6 gunthas; crop 18 annas according to the formulæ. Incidence on one crop alone.
0 4	Do.	22½	6 tops, 100 bundles of leaves.	*Experiment No. 33.*—*Malbári* and *Vánsi* canes mixed on, *káli chikan*, rich black crumbling soil manured with 40 carts of cattle manure per acre and growing (1) rice, (2) rice, *vál* and castors and (3) sugarcane. *Malbári* cane was alone planted at first, but owing to neglect in watering germination was irregular. *Vánsi* cane subsequently planted to fill vacancies. Crop irrigated during the hot season twice a month from a well. Latter rains deficient which affected the crop slightly. Cultivation fair. Field not fenced and slightly damaged by jackals in consequence. Tops fed to cattle working the mill. Therefore their value Rs. 10-8-0 excluded from column 11.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	SURAT—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. Anna Gopál Kotvál, District Deputy Collector.									
34	Olpád (Olpád)... ...	Rice (Sáliu), 15th October 1893.	20	1,800	76	2,392 in husk	3,100	57 2 5	8 5 5 O. S.	14·59
35	Do. (Bhesán) ...	Do. (Kada), 21st October 1893.	20	1,800	68	3,586 in husk	4,850	79 1 8	14 8 6 O. S.	18·37
36	Do. (Sáyan) ...	Do. (Mánjarvel), 13th November 1893.	20	1,800	67	3,144 in husk	6,190	77 4 7	11 12 4 O. S.	15·23
	Mr. J. W. Mollison, Superintendent of Farms.									
37	Chorási (Kumbhárya)..	Potatoes (Tarabdi albi), 23rd February 1894.	15	9,140	788	7,513	...	141 6 3	17 8 0 O. S.	12·37
	THÁNA.									
	Mr. L. G. Deshmukh, Assistant Collector.									
38	Sháhápur (Kasára) ...	Elusine coracana (Rági), 2nd November 1893.	10	620	3	351	...	7 4 0	0 3 1 O. S.	2·65
39	Kalyán (Gerse) ...	Gram, 20th February 1894.	20	500	48	564	...	15 8 0	0 3 4 O. S.	1·34
40	Sháhápur (Cherpoli) ...	Do. 27th February 1894.	16	400	44	391	...	10 12 0	4 2 6 O. S.	38·73
	Mr. C. W. M. Hudson, Assistant Collector.									
41	Dáhánu (Káse) ...	Do. 28th February 1894.	12	250	56	867	...	31 14 6	1 9 3 O. S.	4·94

Northern Division, 1893-94—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 4	37 (weight ser.)	$44\frac{4}{13}$	$8\frac{6}{7}$	*Experiment No. 34.*—Rice, *Sâliu*, on black, *chipat*, soil manured with 11 maunds ($3\frac{5}{8}$ cwts.) of castor cake per acre. Field grows rice always followed or not by a second crop of *val* and castors as the season is favourable or otherwise. Seedlings from 4 gunthas covered an acre of plantation. Season favourable and tillage good. Seed rate high. The outturn 600 lbs. over the maximum crop of the formulæ.
0 4	Do.	$48\frac{1}{3}$	$8\frac{13}{14}$	*Experiment No. 35.*—Rice, *Kada*, every year on superior black soil manured with 30 carts of cattle dung per acre. Crop irrigated 7 times from an adjacent tank. Season, &c., as above. Seedings from 4-8 gunthas required for an acre of field. Seed rate high. Yield double the formulæ standard. It is probable that a second crop might be taken occasionally on this field.
0 4	Do.	$44\frac{4}{13}$	$8\frac{6}{7}$	*Experiment No. 36.*—Rice, *Mânjarvel*, on similar soil but without any irrigation facilities. Field manured with 40 loads of cattle dung per acre. Rice taken every year with or without a second crop of castor or *val* as the season permits. Season, &c., as above. Yield $1\frac{3}{4}$ times the maximum crop of the formulæ.
0 4·117	Do.	$53\frac{1}{3}$	...	*Experiment No. 37.*—Indigenous potatoes, *tarabdi albi*, a very small red variety, on rich *gorâdu* garden land taken as a second crop after ginger which was manured with about 35 tons per acre of compost of night-soil, sweepings and rubbish. Rotation :—(1) ginger with chillies on borders of beds, (2) brinjals and (3) ginger and potatoes in the current year. Crop watered 9 times at an interval of 8 to 10 days from a well by means of 2 *mots*. Season and tillage both good. Seed rate low due to the very small size of the seed used. Yield compared to the formulæ 12 annas. Incidence on the second crop alone.
0 10	59	$48\frac{2}{5}$	...	*Experiment No. 38.*—Red *nâgli* on unmanured *murmâd* land that lay fallow for two years and grew black gram in the year before the tested crop. Season unfavourable, rain being excessive at commencement and insufficient afterwards. Cultivation indifferent. Area of seed-bed reported at $\frac{1}{3}$ acre for an acre of field, very high. Seed rate less than half the formulæ rate and the yield only 7 annas according to the same standard. By-product not valued.
0 8	71	$36\frac{2}{5}$	...	*Experiment No. 39.*—Gram every year on unmanured rabi land in which moisture is kept by impounding rain water in the monsoon. Season favourable; and tillage good. Crop full maximum. By-product not valued.
0 8	Do.	Do.	...	*Experiment No. 40.*—Gram, an after crop, on good rice land growing rice always followed by a second crop when season allows. Season favourable; and tillage good. Sample ser in this instance not forwarded to this office. Incidence on the second crop alone.
0 4	$75\frac{11}{16}$	$27\frac{1}{6}$	...	*Experiment No. 41.*—Gram as a second crop after rice on kharif land retentive of moisture and growing the pulse after rice in each of the last two years. Season average and cultivation good. Seed rate about average. Yield $1\frac{3}{4}$ times that for the maximum standard of the formulæ. The pulse valued rather high; and the by-product, though admittedly an useful fodder for cattle, not valued. Test area below the prescribed minimum.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	THA'NA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. V. R. Patvardhan, District Deputy Collector.									
42	Váda (Gátes)	Gram, 17th February 1894.	16	425	86	775	...	27 0 0	2 10 8 O. S.	9·87
43	Do. (Váda)	Do. 19th February 1894.	20	500	88	1,152	...	39 0 0	3 3 11 O. S.	8·32
44	Máhim (Yedvan) ...	Sugarcane (blackish red), 2nd March 1894.	16	4,000	22,800	8,422 gul, 1,067 kákvi.	8,055 tops.	646 3 6	4 7 9 O. S.	0·69

Northern Division, 1893-94—concluded.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-product.	Remark
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwt.	
0 10	70	28⅔	...	*Experiment No. 42.*—Gram on middling black kharif land incapable of growing any crop during the monsoon because water stagnates on it. Season favourable though rain at end of December did some slight damage, the crop being in flower at the time. Tillage careful. Crop 1½ times the maximum standard of the formulæ. By-product, useful for ráb purposes, not valued. High seed rate accounted for by its being broadcasted and not drilled.
0 10	72	29½	...	*Experiment No. 43.*—Gram on darkest brown, *chikanvat*, soil, growing rice every year and a second crop of gram only occasionally. Season very favourable; and tillage good. Outturn more than double the maximum of the formulæ.
0 4	28 (weight ser.)	14⅓ gul, 23 kákvi.	5½	*Experiment No. 44.*—Sugarcane on black *bátgáyat* land, *válvanti mordi*, growing rice for two years and sugarcane in the third. Crop manured with castor cake applied in three top dressings at an interval of a month between each, the first one two months after planting. Crop watered from a well five times before the rains and once a week from October to March. Tillage careful. Crop 10 months old at the time of cutting. *Kákvi* or molasses made from immature shoots.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	KHANDESH.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p	Rs. a. p.	Per cent.
	Mr. C. G. Dodgson, Assistant Collector.									
45	Nandurbár (Ghotáne)	Spiked millet (Bájri), 18th November 1893.	7	130	11	140	231 straw, 19 chaff.	4 1 6	0 6 0 O.S.	9·16
46	Do. (do) ...	Do. (do.) ...	12	400	14	357	484 straw, 49 chaff.	8 13 8	0 7 4 O.S.	5·18
	Mr. C. N. Seddon, Assistant Collector.									
47	Sindkheda (Varsi) ...	Wheat (Bansi), 31st January 1894.	12	500	75	564	248	15 7 8	2 10 8 R.S.	17·23
48	Do. (do.) ...	Linseed, 21st February 1894.	10	155	12½	377 seed.	...	19 12 0	2 11 3 R.S.	13·68
49	Bhusával (Bhusával)	Wheat (Nim-Bansi), February 1894.	14	910	129	992	350	35 12 6	4 9 10 R.S.	12·8
	Mr. P. R. Cadell, Assistant Collector.									
50	Bhusával (Sátáre) ...	Linseed (Javas), 30th January 1894.	16	400	15	306 seed.	180	16 15 1	3 10 4 R.S.	21·52
51	Do. (do.) ...	Wheat (Pote Lál Káthe), 30th January 1894.	13 to 14	590 to 670	53⅓	449	580	19 12 10	3 8 2 R.S.	17·73
	Mr. S. B. Chitgubi, District Deputy Collector.									
52	Páchora (Páchora) ...	Do. (Bansi), 20th February 1894.	12	500	125	721	992	32 15 0	2 0 0 R.S.	6·07

Central Division, 1893-94.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 9	140.	57½	1 6/7 straw, 5/16 chaff.	*Experiment No. 45.*—*Bájri* on gravelly *barad* land growing always the same crop. No manure applied. Heavy early rain delayed sowing until September. Tillage indifferent and crop poor. By-product valued very high.
0 11	144	52½	3 1/7 straw, 5/8 chaff.	*Experiment No. 46.*—*Bájri* continuous on *kankráli* unmanured soil of nearly the same class as above. Season, &c., same. Seed-rate high. Tillage good and the outturn better.
0 20	142½	39	2 3/14	*Experiment No. 47.*—Dry-crop wheat, *bansi*, on good black soil growing usually wheat, cotton, and linseed in turn. Season only fair owing to absence of rain for sowing in October and its failure after November. Cultivation indifferent. Seed rate high.
0 10	120	19	...	*Experiment No. 48.*—Linseed on similar soil and growing the same crops in rotation. Season, &c., as above. Seed-bolls only partially filled owing to absence of later rains. Crop 15 annas according to the formulæ standard.
0 8	141	39	5/16	*Experiment No. 49.*—Irrigated wheat, *nim-bansi*, on good black soil. Area under wheat grew cotton last year and was then manured with about 5 carts of cow-dung, nightsoil and household refuse per acre. The rest of the field this year under onion, garlic, tabacco, and other garden crops. Crop irrigated 4 times from a well at an interval of a fortnight between each watering. Season fair; tillage good. Seed rate high.
0 10	120	18½	4 4/7	*Experiment No. 50.*—Linseed on black soil which is usually not manured, but is favourably situated near a town. Rotation undefined:—(1) wheat, (2) linseed, (3) cotton, and (4) wheat. Season quite favourable to the crop, but tillage indifferent. Outturn only 13 annas according to the formulæ. The incidence of assessment somewhat high. The test crop is one in rotation with cotton which perhaps bears the chief part of the assessment.
0 8	141	27¾	1 3/4	*Experiment No. 51.*—Dry-crop wheat, *káthe*, on similar land manured with 5 or 6 carts of cow-dung spread over different portions of the field every year. Rotation:—wheat alternates with cotton. Season rather dry at sowing and later rain in November untimely. Tillage not careful. Crop less than 12 annas. High incidence for reasons given above.
0 15	136	32	6/7	*Experiment No. 52.*—Yellow wheat, *bansi*, on black *khárvat* soil liberally manured with 20 carts of cotton refuse per acre and growing cotton, *jowári*, *mug*, tobacco and other garden crops in various parts of the field. Season fair and tillage good. Seed rate high, being 4 times the formulæ standard. Crop tested in two patches and the results wrongly shown as two separate experiments; average of the two shown here. Experimenter forwarded two sample sers, of which one weighed in this office 3½ tolas short of the recorded weight. By-product valued very high. Crop 15 annas according to the formulæ.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	KHA'NDESH—*contd.* *Mr. Kázi Kamruddin, District Deputy Collector.*		Annas	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
53	Dhulia (Valvádi) ...	Spiked millet (Bájri), 30th October 1893.	16	640	10⅓	631	540 bundles.	20 9 7	1 9 0 O. S.	7·58
54	Amalner (Amalner) ...	Wheat (Bansi), 3rd February 1894.	16	800	75	749	886	24 0 0	2 7 9 R. S.	10·35
	NA'SIK. *Mr. R. B. Stewart, Assistant Collector.*									
55	Málegaon (Dábhádi) ...	Great millet (Jowári), 4th December 1893.	14	605	7½	341	480	11 7 8	1 1 6 R. S.	9·52
56	Násik (Deoláli) ...	Gram, 11th February 1894.	10	205	47	460	271	11 6 5	2 4 5 R. S.	19·96
	Mr. G. H. Hampton, Assistant Superintendent, Deccan Revenue Survey.									
57	Chándor (Dugaon) ...	Groundnut, 25th November 1893.	20	4,000	50	3,610 fresh-nuts.	6,302	122 0 0	5 13 6 R. S.	4·79
58	Do. do. ...	Do. 26th November 1893.	20	4,000	50	3,938 Do.	6,302	132 0 0	2 12 6 R. S.	2·10
59	Do. do. ...	Do. 27th November 1893.	18	3,600	50	1,559 Do.	4,000	57 8 0	0 3 0 R. S.	0·32
60	Yeola (Nágaon). ...	Sugarcane (Pundia), 18th December 1893.	16 to 18	...	...	Number of canes—16,032 large, 7,440 medium, 7,552 small 31,024	...	1,102 0 0	1 7 7 R. S.	0·13

Central Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 10	162	41½	100 bundles.	*Experiment No. 53.*—*Bájri* on fairly good black soil, not manured for the last four years. *Jowári* and cotton grown this year on other parts of the field. Rotation undefined. The previous crops were :—cotton in 1891 and *bájri* and *math* in 1892. Season favourable; and tillage fair. Sample of grain forwarded to this office weighed 155¾ tolas only.
0 10	146	37½	2	*Experiment No. 54.*—Dry-crop wheat on fairly good black soil, which did not receive any manure for the past three years and grew during that period (1) *bájri*, (2) cotton and (3) *jowári*, cotton and *tur*. Season favourable; tillage good. Seed rate very high.
0 8	147½	51	6/7	*Experiment No. 55.*—Kharif *jowári* on unmanured middling black soil growing linseed and *jowári* alternately. Season fair, but the crop suffered somewhat from deficiency of late rain. Cultivation fair. By-product valued very high. Crop only 11 annas according to the formulæ.
0 10	115	44¼	2⅝	*Experiment No. 56.*—Unmanured and unirrigated gram taken as a sole crop on good blackish soil growing wheat and gram in alternate years. Season fair, the crop suffering from deficient rains. Tillage not good. Seed rate high. Crop 15 annas according to the formulæ. Incidence somewhat high. The land apparently capable of being double cropped, but only one raised during the year.
0 5	80 (weight ser).	32⅘	4⅝	*Experiment No. 57.*—Groundnut on the *bágáyat* portion of a good black soil field, dressed with 25 to 30 carts of cattle manure and growing *bájri*, and *bhuimug* in alternate years. A second crop of wheat or gram taken after *bájri*, if sufficient water available. Well as also channel irrigation used to water the crop, but its extent is not reported. Season favourable and tillage good. Figure in column 7 shows the weight of fresh nuts, whilst the formulæ estimate in column 5 is for dry nuts. The same remarks apply to the next two tests. Both the principal and the by-product valued high.
0 5	Do.	Do.	Do.	*Experiment No. 58.*—Same crop on mixed black soil grown under like conditions, but with a heavier dressing of manure, 30 to 35 carts per acre. Other remarks as above.
...	Do.	Do.	3⅛	*Experiment No. 59.*—Same crop on mixed black soil with a considerable proportion of lime. Field lightly manured with 4 to 5 loads per acre of cattle-dung. Crop irrigated from two old wells which were only partially filled, owing to scanty rainfall, and the outturn low in consequence. The land grows *bájri* principally, followed by wheat, earthnuts, onions, &c., in small patches. Water rate evidently not included in the assessment shown in column 10.
0 2·5	...	21⅓ large, 32 medium, 64 small, canes.	...	*Experiment No. 60.*—Sugarcane, *pundia*, on black soil manured with twenty carts of cattle-dung per acre before sowing. Field usually grows wheat with *bájri* followed by gram at intervals. Crop irrigated from a well. Extent of watering not given, but stated to be not liberal. The crop was not turned into *gul* as usual, and therefore entry in column 7 simply shows the number of canes per acre. Produce valued at retail rates which ruled very high. Sets for planting cost Rs. 22 per acre. Area of test below minimum due to owner's unwillingness to cut more crop, owing to difficulty in selling it off during a day.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	AHMADNAGAR.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. M. C. Gibb, Assistant Collector.									
61	Nagar (Sárole Kásár)	Great millet (Jowári), 20th January 1894.	13	710	8	420	417 bundles.	13 9 1	0 12 5 R. S.	5·72
62	Sangamner (Loni) ...	Hard red wheat (Káthe), 6th February 1894.	11	350	20	479	...	12 6 0	1 1 8 R. S.	8·92
	Mr. Sorábji Padamji, Assistant Collector.									
63	Párner (Dhotre B.) ...	Spiked millet (Bájri), 18th November 1893.	8	160	9¼	677	1,860 straw, 200 chaff.	20 5 10	0 5 6 R. S.	1·68
64	Karjat (Bhámbore) ...	Great millet (Shrikhandi Jowári) and	12	500	8	615	2,475	13 8 0	0 11 5 R. S.	4·83
		Safflower (Kardai), 19th January 1894.	12	65	1¼	66	...	1 4 0		
								14 12 0		
65	Do. (Karjat) ...	Great millet (Dagdi Jowári) and	10	280	5	447	1,960	12 13 0	0 7 6 R. S.	3·71
		Safflower (Kardai), 31st January 1894.	10	60	1¾	174	...	3 12 11		
	Mr. V. B. Vádekar, District Deputy Collector.							16 9 11		
66	Kopargaon (Puntámbe).	Spiked millet (Bájri), 23rd November 1893.	16	560	6	532	1,192 straw, 149 chaff.	17 9 4	1 0 0 R. S.	5·68
67	Do. (do.) ...	Do. (do.) 24th November 1893.	14	470	6	438	776 straw, 113 chaff.	14 11 8	0 13 8 R. S.	5·79
	POONA.									
	Mr. H. W. J. Bagnell, Assistant Collector.									
68	Haveli (Parvati) ...	Do. (do.) 2nd November 1893.	16	640	14	906	3,476	29 15 3	1 15 5 R. S.	6·55

Central Division, 1893-94—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 12	100	41	125 bundles.	*Experiment No. 61.—Jowári* with *kardai* on unmanured black soil. Rotation undefined :—(1) *jowári*, (2) *jowári* and (3) *bájri* with subordinate mixtures in each case. Season fair; but the cultivation bad. The subordinate crop occupying about ¼ area remained untested. The outturn less than 11 annas according to the formulæ.
0 10	110	39½	...	*Experiment No. 62.*—Wheat, *káthe*, with a sprinkling of safflower on black soil, growing the same crop every year. Season not favourable, but tillage good. Seed rate low. By-product valued at 4 annas per acre, but not weighed. The sample ser weighed in this office 107¾ tolas only.
0 8	120	37	21⅖ straw, 1⅖ chaff.	*Experiment No. 63.—Bájri* on *khalgat, i.e.*, shallow black soil with an underlayer of light coloured earth. Field manured with 3½ cart-loads of cow-dung per acre. Rotation :—(1) *bájri* and wheat, (2) *bájri, tur* and *math*, and (3) *bájri, tur, math* and gram. Rain somewhat deficient. First sowing failed. Cultivation good. Crop 17 annas according to the formulæ though estimated at 8 annas only.
0 8	109	56	8⅘	*Experiment No. 64.*—Late *jowári* and *kardai* in rows (5:1) on black soil, growing the same crop every year without any manure. Rainfall scanty, and the crop damaged by cloudy weather in December. Tillage good. Crop 15 annas according to the formulæ. By-product valued very low.
	86	53	...	
0 8	109	44¾	6¼	*Experiment No. 65.*—Same crop every year also on black soil. Proportion of *jowári* to *kardai* reported 10:3, but probably 3:1. Season, &c., as above Tillage indifferent. Crop 12 annas of the formulæ.
	85	45¾	...	
0 8	122	37½	3⅓ straw, 3 3/16 chaff.	*Experiment No. 66.—Bájri* on light black soil dressed with 10 carts per acre of cattle manure. Field grows the same crop every year and occasionally a second crop of gram when season permits. The crop suffered from a long break in August, and the outturn reduced to average. Tillage fair. Sample of grain received in this office weighed 119½ tolas.
0 8	Do.	Do.	2⅘ straw, 3 3/14 chaff.	*Experiment No. 67.*—The same crop grown continuously on soil of similar class but assessed lower. Field manured with half the above quantity per acre. Season, &c., as above. Sample weighed 4½ tolas short in this office.
0 8	93	33⅓	11	*Experiment No. 68.—Bájri* on fairly good soil, partly black and partly *bhurkhad*, varying in depth from 8 to 24 inches. Rotation :—(1) groundnut, (2) *bájri* and gram (irrigated), and (3) do. Rain not quite seasonable; but cultivation good. Yield more than bumper according to the formulæ.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of.		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	POONA—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. H. W. J. Bagnell, Assistant Collector—continued.									
69	Mával (Vadgaon) ...	Eleusine Coracana (Late Nágli) 25th November 1893.	15	1,110	16	550	630	15 7 6	0 9 6 R.S.	3·84
70	Do. do. ...	Rice (Ambemohor), 25th November 1893.	20	3,000	50	2,326 in husk	3,360	58 7 0	2 9 3 R.S.	4·41
	Mr. T. D. Fry, Assistant Collector.									
71	Indápur (Bhigvan) ...	Great millet (Mál-dándi Jowári) with	11	475	7½	276	1,345 kadbi, 75 chaff.	9 8 9	0 11 2 R.S.	6·43
		Safflower (Kardai), 18th January 1894.	16	80	2	54	...	1 4 10		
								10 13 7		
72	Do. do. ...	Gram with Safflower.	5	50	...	139	202	3 12 0	0 11 2 R.S.	13·81
		(Kardai), 18th January 1894.	16	80	2	54	...	1 4 10		
								5 0 10		
73	Do. (Loni) ...	Great millet (Mál-dándi Jowári) with	13	725	5½	651	2,200 kadbi, 60 chaff.	16 2 2	0 13 2 R.S.	4·54
		Safflower (Kardai), 25th January 1894.	20	100	1	94	...	2 0 0		
	Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.							18 2 2		
74	Purandhar (Sásvad) ...	Spelt wheat (Khapli or Jod), 13th February 1894.	18	1,620	86	2,289 husked	2,160 bundles.	95 5 6	3 4 1 R.S.	3·41
75	Do. do. ...	Groundnut, 15th February 1894.	16	3,200	51½	2,755 in shell	...	833 9	5 1 1 R.S.	6·09

Central Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-Product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	79½	36⅔	12	*Experiment No. 69.—Nágli, garvi* or late, on reddish *ma'l varkas* land growing (1) *nágli*, (2) *jowári*, and (3) *til*, after three years' fallow. Seed-bed manured at the rate of 20 carts of cow-dung and grass per acre, but its proportionate area per acre of plantation not given. Rain at end of October deficient, and reduced the outturn to 11 annas. Tillage good. Seed rate high. Sample of grain not received in this office.
0 4	81	41½	12	*Experiment No. 70.*—Planted rice, *ambemohor*, continuously on *gaddi* or rice land, on which no second crop is raised owing to excess of moisture. 12 gunthas of seed-bed, rábed with 12 carts of cow-dung and grass, apparently furnished seedlings for an acre of plantation. Season on the whole fair; and the crop full average though estimated at the bumper standard. Seed rate high. Grain sample not received.
0 8	88	45⅛	3 9/14 kadbi, 2 6/7 chaff.	*Experiment No. 71.—Jowári* and *kardai* in rows (7:1) on medium black, *gundal*, soil, sparingly manured with ¼ cart of cow-dung per acre, and growing the same crop every year. Gram substituted annually, however, for *jowári* in portions of the field. Season somewhat unfavourable owing to deficiency of November rain. Tillage careful. Outturn of *jowári* not more than 8 annas according to the formulæ. Subordinate crop not quite ready for cutting at the time of the experiment, and the results from the following test made applicable here, the conditions in both being identical.
	68	41⅘	...	
0 8	94	33	11 9/14	*Experiment No. 72.*—Gram with the same subordinate crop on another part of the above field. Conditions same as above. Outturn of gram 9 annas according to the formulæ. Seed rate for gram unknown.
	68	41⅘	...	
0 8	94	50⅜	6⅔ kadbi, 3⅔ chaff.	*Experiment No. 73.—Jowári and kardai* in rows (7:1) on unmanured light black soil, *nim káli*, growing the same crop every year. Season, &c., as above. Samples of *jowári* and *kardai* weighed in this office 3½ and 2¾ tolas, respectively, short of the recorded weights.
	73	46⅘	...	
0 4	96	27	200 bundles.	*Experiment No. 74.*—Wheat, *khapli*, on good black soil manured with about 18 carts per acre of ordinary manure and irrigated from a well in the field and from a channel, supply from which, however, is ordinarily available only till the end of November. Rotation undefined:—*jowári* with or without *kardai* having been grown during the past two years. Season favourable and tillage good. Yield more than bumper according to the formulæ. *Khapli* straw, not ordinarily used as fodder, valued rather high,—Rs. 10-12-9 per acre.
0 4	76 (weight ser.)	33⅓	...	*Experiment No. 75.*—Groundnut on similar soil irrigable from a well and from a pát. The latter supply lasts till February. The field was manured with 16 cart-loads per acre of ordinary manure, and grows potato, garlic, spelt wheat and other like garden crops without any regular rotation. Season, &c., as above. Crop 14 annas according to the formulæ. By-product, useful as good fodder, not valued.

Summary of Crop Experiment Reports,

O. S. = Original Survey ;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	POONÁ—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. J. W. Mollison, Superintendent of Farms.									
76	Haveli (Hadapsar) ...	Red onions (Kánda) 7th May 1894.	17	8,500	19½	26,974	...	147 8 2	1 4 9 R.S.	0·88
77	Do. (Mánjri B.) ...	Sugar-cane (Pundia), 27th February 1894.	14	...	about 18,000 sets.	7 1,320 canes.	9,930 tops.	558 12 0	1 4 9 R.S.	0·23
	SHOLÁPUR.									
	Mr. R. C. Brown, Assistant Collector.									
78	Karmále (Pánde) ...	Gram, 30th January 1894.	14	405	40	606	...	16 5 10	0 13 7 R.S.	5·18
79	Do. do. ...	Linseed. (Javas), 30th January 1894.	10	155	25	160 seed.	...	8 7 0	0 12 0 R. S.	8·88
	Mr. G. Scott, District Deputy Collector.									
80	Pandharpur (Shegaon).	Gram, 25th January 1894.	12	300	38	352	....	7 11 4	0 5 4 R.S.	4·32
81	Málsiras (Velápur) ...	Do. 29th January 1894.	8	120	30	398	...	8 12 0	0 4 5 R.S.	3·15
	Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.									
82	Pandharpur (Pandharpur).	Great millet (Máldándi and Gudadi Jowári), 24th January 1894.	12	700	10½	477	2,250 kadbi, 80 chaff.	19 3 3	1 0 11 R.S.	5·50

Central Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 2·73	76 (Weight ser.)	183	...	*Experiment No. 76.*—Red onions on by far the best portion of mixed black field manured with 36 carts per acre of farm-yard manure before sowing and growing chillies and fodder *jowári* during the last two years. About 7 carts of the same manure again used as top-dressing after transplantation. Season good; and tillage careful. Crop irrigated 12 times from a well at an interval of 7 or 8 days between each watering. Seed rate, compared to the formulæ, (3 lbs. per acre), very high and the outturn over 3 times the same standard.
0 4	...	...	...	*Experiment No. 77.*—Sugar-cane, *pundia*, on medium black soil growing:—(1) capsicum and (2) maize during the previous two years. Land heavily dressed with 25 tons of farm yard manure per acre before sowing and a top-dressing of 2,400 lbs. per acre of fish manure applied when crop was 6 months planted. Crop irrigated 24 times from the Khadakvásla canal. Figure in column 7 gives the weight of canes; the produce was not, as usual, turned into *gul*, but purchased standing to furnish sets for planting. Column 9 includes Rs. 58-12-0, the cost of cutting and stripping the cane and forming sets. Stripped leaves left on the field according to agreement. One acre of cane was found sufficient to give sets for planting 11 acres.
0 8	$131\frac{1}{3}$	37	...	*Experiment No. 78.*—Gram on good black soil, *mulshi*, growing in alternate years *jowári* and gram each with rows of *kardai*. Safflower not tested and proportionate area unknown. Rain somewhat excessive for gram. No manure applied. Tillage indifferent. Seed rate high. The crop, estimated at 14 annas only, yielded a bumper outturn according to the formulæ.
0 8	123	$18\frac{9}{10}$	...	*Experiment No. 79.*—Linseed on black, *chopan*, soil growing *jowári* year after year. This year the cultivator being unable to sow *jowári* put in linseed instead. Season good; tillage indifferent. Seed rate double the formulæ (12 lbs.). The sample of oilseed weighed $120\frac{1}{2}$ tolas only.
0 8	$148\frac{5}{8}$	$45\frac{2}{3}$	...	*Experiment No. 80.*—Gram on inferior black, *chikan*, unmanured soil, growing *jowári* for 3 years followed by gram in the 4th. Season fairly good; but tillage indifferent. The sample received in this office weighed 140 tolas only and is reported by the experimenter to have been weighed when rather wet. By-product neither valued nor weighed. Pulse valued rather low in both this and the following tests.
0 8	$147\frac{1}{2}$	$45\frac{1}{4}$	...	*Experiment No. 81.*—Same crop on black, *marul*, soil irrigable from a well built since revision settlement. Rotation:—(1) *bájri*, (2) gram and (3) *jowári*. Season and tillage as above. Crop watered once in December. Outturn better than in the above test and represents a 14-anna crop according to the formulæ.
0 8	143	44	$2\frac{1}{2}$ kadbi, $2\frac{1}{7}$ chaff.	*Experiment No. 82.*—Rabi *jowári, máldándi and gudadi*, yellow and white, on unmanured mixed black soil growing *jowári* and gram during the previous two years. Rain in November deficient but season on the whole favourable. Tillage good. Crop only 10 annas according to the formulæ. Sample ser weighed 4 tolas short in this office.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	SHOLA'PUR—*continued.* *Mr. F. B. Young, Divisional Inspector, L. R. and Agriculture, C. D.*—continued.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
83	Pandharpur (Shegaon).	Gram, 27th January 1894.	16	480	24½	788	600 chaff.	21 3 2	1 1 11 R.S.	5·28
	SA'TA'RA. *Mr. W. C. Rand, Assistant Collector.*									
84	Koregaon (Koregaon).	Great millet (Árgadi Jowári), 21st November 1893.	14	940	12	302	2,252	15 7 6	0 15 10 R.S.	6·41
85	Vái (Vái)	Gram, 23rd January 1894.	16	560	64	438	...	13 11 10	4 0 11 R.S.	29·53
86	Do. do.	Do. ...	18	630	58	540	...	16 8 1	4 1 4 R.S.	24·74
	Mr. S. R. Arthur, Assistant Collector.									
87	Karád (Umraj) ...	Sugar-cane (Pundia), 10th April 1894.	10	1,860	1,400 canes.	4,227 gul.	16,805 tops.	260 11 2	1 14 6 O.S.	0·73
	Mr. R. J. C. Lord, Assistant Collector.									
88	Pátan (Malhárpeth) ...	Great millet (Jowári), 16th February 1894.	12	600	10¾	1,268	2,938	36 15 0	2 9 0 O.S.	6·93
	Mr. J. M. Cursetji, District Deputy Collector.									
89	Mán (Bidál)	Sugar-cane (Pundia), 5th April 1894.	12	3,000	2,720 canes.	8,998 gul.	12,373 tops, 8,045 leaves.	379 10 0	5 10 0 R.S.	1·48

Central Division, 1893-94—concluded.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	143	42	$2\frac{1}{7}$	*Experiment No. 83.*—Gram on black soil growing every year *jowâri*, *kardai* and gram in different parts of the field. Crop not manured. Season favourable; and tillage good. Crop more than full maximum according to the formulæ.
0 8	$116\frac{1}{4}$	$32\frac{3}{4}$	$3\frac{1}{2}$	*Experiment No. 84.*—Kharif *jowâri* on reddish black, *mâl*, land, growing during the previous three years (1) *bâjri* with pulses and (2) and (3) *jowâri* with green gram. Season and tillage both fair. No manure applied. Seed rate double the formulæ standard; grain eaten by birds. The outturn is independent of green gram which occupied every 6th row. The sample received in this office weighed $4\frac{1}{2}$ tolas short of the reported weight.
0 8	113	$31\frac{9}{10}$	...	*Experiment No. 85.*—Gram taken as a second crop after *udid*, black gram, on good black soil manured for the rain crop with about 8 carts of cow-dung per acre. The crops grown in the previous two years were:—(1) *bâjri* and (2) kharif *jowâri*. Rain in October somewhat deficient. Seed rate very high. Tillage good. Incidence on the 2nd crop alone.
0 8	116	$32\frac{3}{4}$	...	*Experiment No. 86.*—Same crop with a sprinkling of safflower and linseed on similar land manured for the first crop with about 2 carts per acre of the ordinary manure. Rotation:—(1) *bâjri* and *pâvta*, (2) and (3) *jowâri* and wheat. Season, &c, as above. The outturn exclusive of the sprinklings which were untested. Incidence as above on the 2nd crop alone.
0 4	78 (weight ser.)	$20\frac{4}{5}$	$2\frac{4}{7}$	*Experiment No. 87.*—Sugarcane, *pundia*, on a field the soil of which varies considerably. Sugarcane, *jowâri* and groundnut grown in successive years. Field manured with 15 carts of cow-dung and heavily folded with sheep. Crop irrigated once a week from a well built since settlement. Cultivation good.
0 8	121	$40\frac{1}{3}$	$4\frac{6}{7}$	*Experiment No. 88.*—Late *jowâri* taken as a second crop on black soil manured with 8 carts of cow-dung per acre before the sowing of the first crop of maize and black gram. Rotation:—(1) maize and *jowâri*, (2) groundnut and (3) *jowâri*. Season favourable and cultivation good. Outturn, exclusive of the subordinate crops, gram and safflower, which were almost failures, full maximum though estimated at 12 annas only. The sample ser received in this office weighed $111\frac{1}{4}$ tolas only, and it is doubtful whether the experimenter allowed the grain to dry thoroughly before weighment. Figures therefore untrustworthy.
0 5	80 (weight ser.)	$23\frac{1}{2}$	$1\frac{1}{3}$ tops, $2\frac{1}{4}$ leaves.	*Experiment No. 89.*—Sugarcane, *pundia*, on medium black soil, *moryal*, manured with 17 cart-loads per acre of ordinary manure and with sheep folding (333 per acre) for a month. Field irrigated from a *dharan* fed from a channel. Season and tillage good. Seed rate high compared with the formulæ (1,500 canes per acre); and the outturn 3 times the yield recorded for a 12-anna crop. Fresh tops fed to the cattle working the mill and stripped leaves burnt as fuel in preparing the *gul*; therefore their value, estimated at Rs. 119, excluded from column 9.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	BELGAUM.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. R. E. Enthoven, Assistant Collector.									
90	Parasgad (Rainápur)...	Great millet (Gidjol), 22nd November 1893.	16	1,120	14⅓	273	5 bundles kadbi, 45 chaff.	5 15 7	0 11 3 R. S.	11·76
91	Do. (Chulki) ...	Do. (do.) 4th December 1893.	16	1,120	10	609	10 bundles kadbi, 150 chaff.	11 9 0	1 4 10 R. S.	11·26
92	Do. (do.) ...	Do. (do.) 6th December 1893.	20	1,400	5¼	1,493	16 bundles kadbi, 320 chaff.	27 5 4	1 3 0 R. S.	4·34
	Mr. C. C. Boyd, Assistant Collector.									
93	Gokák (Gokák) ...	Do. (Jola), 1st December 1893.	14	940	4¼	398	2,220 kadbi, 90 chaff.	15 1 3	1 5 0 R. S.	8·70
94	Do. (do.) ...	Spiked millet (Shejji, Bájri), 1st December 1893.	12	400	2⅕	274	625 straw, 85 chaff.	7 14 3	1 7 8 R. S.	18·74
	Mr. N. G. Deshpánde, District Deputy Collector.									
95	Chikodi (Kabbur) ...	Do. (do.) 30th November 1893.	20	800	2	552	792	12 8 10	0 11 7 R. S.	5·76
96	Do. (Vijenagar) ...	Do. (do.) 28th do.	20	800	2	318	547	7 10 7	0 7 10 R. S.	6·39
97	Do. (do.) ...	Do. (do.) 27th do.	20	800	2	214	492	5 8 5	0 3 3 R. S.	3·36

Southern Division, 1893-94.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee. Principal Product.	Prices of Produce per Rupee. By-product.	Remarks.
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	70	57½	5⅓ bundles kadbi, 1⅔ chaff.	*Experiment No. 90.*—Kharif *jowári, gid jol,* with *tur* and *kulthi* subordinate to it; soil reddish black; 16 cart-loads of cowdung per acre applied. Same mixed crop every year. Rain late but favourable. Tillage not careful, field weedy. The subordinate pulses were not tested. Seed rate more than double the formulæ; outturn about 8 annas according to the same standard. The sample ser received, weighed in this office 66 tolas only.
0 8	80½	66	5⅓ bundles kadbi, 2⅔ chaff.	*Experiment No. 91.—Jowári* with *kulthi* subordinate to it. Principal crop only tested. Field has black soil. No manure given. Seed sown late. Season however favourable. Crop 12 annas according to the formulæ. The sample received, weighed 3 tolas short of the recorded weight.
0 15	82	63	5⅓ bundles kadbi, 4⅔ chaff.	*Experiment No. 92.—Jowári* with a variety of subordinate crops; a black soil field heavily dressed with 60 carts of cowdung per acre. Seed sown late but season favourable. The subordinate pulses not tested. The sample found 4 tolas short of the recorded weight. Crop full maximum according to the formulæ.
0 8	82⅞	42½	3½ kadbi, 10⅔ chaff.	*Experiment No. 93.*—Kharif *jowári* on poor red *masári* land sparingly manured with 2½ loads per acre of cattle dung and municipal refuse. Rotation undefined. The same crop with or without *tur* pulse grown during the last three years. Early rain scant; late rain abundant. Outturn slightly above 9 annas of the formulæ.
0 8	85½	43⅘	3⅔ straw, 9⅔ chaff.	*Experiment No. 94.—Bájri* on similar soil manured with 7½ carts of the above manure. Rotation undefined:—*jowári* with pulses for three years followed by *bájri* in the last two; sometimes *navani* (Italian millet) grown if rain favourable. Season same as above. Seed rate under-estimated; outturn 10 annas according to the formulæ. Incidence high, due to poor return.
0 20	86¾	51 1/5	1⅔	*Experiment No. 95.—Bájri* with *kulthi* subordinate to it. The mixed seed occupied every fourth row. Soil mixed black, red and calcareous. Rotation undefined; *bájri* either grown alone, or with a pulse or with *jowári*. Season not favourable, sowing rain late. Long break caused crop to wither. Heavy late rain brought *bájri* to maturity but caused failure of the subordinate pulse. Tillage inferior; field weedy. Yield, exclusive of the subordinate pulse, 14 annas according to the formulæ. By-product valued very high in all the tests (Nos. 95—99).
1 0	85	50⅛	Do.	*Experiment No. 96.*—Same crop on *mardi* land, *i.e.*, having a thin layer of black soil overlying *murum*. Field fairly manured by folding with sheep. The field grows *bájri* almost every year. Season, &c., as above. Tillage good. Outturn 11 annas according to the formulæ. The sample of grain received weighed 6 tolas short in this office.
1 0	Do.	Do.	1⅔	*Experiment No. 97.*—Same crop on reddish *mardi* soil. The same crop without any manure grown for the last five years. Tillage, &c., as above. Crop 9 annas according to the formulæ. The sample weighed 3 tolas short.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	BELGAUM—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent
	Mr. N. G. Deshpánde, District Deputy Collector—contd.									
98	Chikodi (Jagnur) ...	Spiked millet (Shejji, Bájri), 1st December 1893.	20	800	2	218	475	5 10 3	0 3 9 R. S.	4·15
99	Do. (Bágevádi) ...	Do. 29th November 1893.	20	800	2	94	182	2 8 3	0 10 10 R. S.	26·91
	BIJÁPUR.									
	Mr. S. L. Batchelor, Assistant Collector.									
100	Bádámi (Adgal) ...	Great millet (Kenjola Kharif Jowári), 17th November 1893.	17	1,020	8	1,250	3,072	25 8 3	0 7 1 R. S.	1·73
101	Do. (do.) ...	Do. (do.)...	16	960	7	1,252	3,060	25 4 5	0 7 9 R. S.	1·91
102	Do. (Yargop) ...	Do. (do.) 18th November 1893.	16	960	6½	1,177	3,210	24 7 10	0 13 10 R. S.	3·53
	Mr. A. W. G. Chuckerbutty, Assistant Collector.									
103	Bágevádi (Mangoli) ...	Spiked millet (Shejji), 17th November 1893.	11	310	3	422	687	9 3 11	0 6 6 R. S.	4·39
	Mr. R. C. Artál, District Deputy Collector.									
104	Bijápur (Bijápur) ...	Do. (do.), 1st November 1893.	16	640	4⅔	455	1,269	11 1 6	0 6 2 R. S.	3·47
105	Do. (Katkinhalli.)	Great millet (Bile Jola or late Jowári), 20th February 1894.	16	960	6⅓	1,124	2,407	32 3 5	0 9 11 R. S.	1·92

Southern Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
1 0	85	50⅛	1 3/14	*Experiment No. 98.*—Same crop on similar but more stony soil fairly manured by sheep-folding. Season, &c., as above. Crop 9 annas only.
1 0	Do.	Do.	13/14	*Experiment No. 99.*—Same crop on the highest and worst portion of a sloping field. Test area had a thin layer of red soil. Rotation:—*Jowári* and *bájri* mixed almost every year and sometimes *bájri* alone. Crop less than 6 annas of the formulæ. The grain sample weighed 78 tolas only. Incidence high, owing to the poorest portion of the field being experimented upon.
0 10	77	59¼	6 3/14	*Experiment No. 100.*—Kharif *jowári*, *kenjola*, on red *masári* soil manured with 15 cart-loads of cowdung per acre and growing *jowári* and *bájri* in alternate years. Season favourable and tillage good. Low value of the by-product in this and the following two tests attributed to good harvest throughout the district.
0 8	78	60	Do.	*Experiment No. 101.*—Same crop on similar land manured with 12 cart-loads per acre of cow and goat dung. Rotation same as above. Season favourable; tillage fair. Samples of grain for this and the following tests not forwarded to this office as required by standing orders.
0 8	77	59¼	Do.	*Experiment No. 102.*—Same crop on similar but more highly assessed land manured with 20 carts ordinary manure per acre in the previous year. The field grows *jowári* every year. Season, &c., as above.
0 10⅔	149½	49⅘	7/7	*Experiment No. 103.*—*Bájri* on black soil with subordinate crops of *navani* and *tur* in separate rows. Field manured three years ago with 34 carts of ordinary manure per acre. *Jowári* and *bájri* with subordinate pulses or oilseeds grown indiscriminately. Season fair; seeds or seedlings partially destroyed by rats which did considerable damage in the district early in the monsoon. Tillage good. Sample forwarded to this office weighed 146 tolas only.
0 10½	146	44⅞	12	*Experiment No. 104.*—*Bájri* with a subordinate sprinkling of *tur*, *ambádi*, *til* and *rála* on sandy loam soil locally called *halbhumi*. The field was Government waste before 1891-92. The crop tested was the second arable crop taken since. Land manured with 9½ cart-loads of farm-yard manure per acre. Rainfall timely and sufficient for the test crop. A wild grass locally called *vanti kàsa* choked up all the subordinate crops. Outturn 13 annas according to the formulæ.
0 10	134⅞	50¼	2⅜	*Experiment No. 105.*—Late *jowári*, *bile jola*, on reddish black *masári* soil. The field never manured. Rotation undefined. The cropping during the three previous years was:—(1) *Jowári*, (2) wheat and gram and (3) *jowári*. Rainfall timely and sufficient; cultivation fair. Outturn 18 annas according to the formulæ. Sample of grain received in this office weighed 5½ tolas short of the weight reported.

Summary of Crop Experiment Reports,

O. S. = Original Survey ;

	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product.	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	BIJA'PUR—*continued.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. R. C. Artál, District Deputy Collector—contd.									
106	Bijápur (Bijápur) ...	Great millet (Bile Jola or late Jowári), 27th February 1894.	14	805	6⅓	784	2,110	23 14 3	0 11 1 R. S.	2·89
	Mr. J. L. Lushington, Divisional Inspector, L. R. and Agriculture, S. D.									
107	Muddebihál (Muddebihál).	Niger-seed (Gurellu), 1st December 1893.	11	195	1¾	195½ seed.	...	7 13 0	0 3 2 R. S.	2·53
	DHA'RWA'R.									
	Mr. A. R. Bonus, Assistant Collector.									
108	Dhárwár (Kadenhatti).	Eleusine coracana (Rági), 23rd November 1893.	8	300	10⅖	400	1,405	8 7 0	1 0 4 R. S.	12·09
109	Do. (Kelgeri) ...	Do. (do.) 11th December 1893.	11	580	10⅖	721	2,090	15 7 6	0 6 4 R. S.	2·62
110	Bankápur (Shiggaon) .	Pigeon pea (Togri), 15th February 1894.	13	475	21	310	330 husk, 692 stalks.	5 14 2	2 10 9 R. S.	45·39
	Mr. R. E. Kánga, District Deputy Collector.									
111	Gadag (Hulkoti) ...	Eleusine coracana (Rági), 18th December 1893.	12	400	8	1,253	2,228	21 8 4	0 12 2 R. S.	3·53
112	Do. (Dundur) ...	Do. 19th December 1893.	8	160	6½	421	1,108	7 10 11	0 3 5 R. S.	2·77
113	Do. (Gadag) ...	Linseed (Agashi), 8th March 1894.	8	100	1¾	76 seed.	...	3 9 7	1 3 3 R. S.	33·44

Southern Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 10	139 5/8	50 1/4	2 3/8	*Experiment No. 106.*—Same crop on deep black soil locally called *yeri*. Field never manured. Rotation:—(1) *Jowári*, (2) do. and (3) cotton. Season, &c., as above.
0 8	61	25	...	*Experiment No. 107.*—Niger-seed, *gurellu*, on the better portion of a field having reddish brown soil called *kyásari*, growing usually *jowári* and *bájri* mixed with pulses, &c. No manure ever applied. Season favourable for niger which was grown this year as a sole crop for the first time. Tillage good. Seed rate low.
0 8	135 1/2	55 1/2	10	*Experiment No. 108.*—*Rági* on red soil, near the top of an undulation, *mardi masári*. *Jowári* grown during the previous two years. No manure applied. Season good; tillage indifferent. Crop 10 annas according to the formulæ.
0 8	Do.	Do.	7 1/2	*Experiment No. 109.*—Same crop on upland level soil also red. 2 2/3 carts of cow-dung per acre applied. Rági and jowári grown alternately. Tillage and season both good. Crop 12 annas of the formulæ.
1 0	173	57	21 7/8	*Experiment No. 110.*—*Tur*, a subordinate crop, occupying every eighth row. Field has blackish grey *karal* land. *Jowári* with *tur* and green gram subordinate to it grown for the past three years. No manure applied during that period. The figures reported show the actual acre outturn. The *tur* spread out and nearly covered the ground after the other crops were removed. Sample weighed in this office 170 tolas only.
0 11 11/16	157	76 1/2	3 5/7	*Experiment No. 111.*—*Rági* with a mixture of *tur* and green gram in every sixth row on red, *kemp masári*, land growing without manure *jowári* and *rági* in alternate years each with a mixture of pulses. The field though not manured has the advantage of being close to the village and is naturally profited thereby. Rain somewhat deficient, but season on the whole good. Tillage also good. Subordinate crops not tested, yet the outturn 1 1/2 times the maximum of the formulæ.
0 12	152	74	5	*Experiment No. 112.*—Same crop on similar but poorer unmanured soil. Rotation:—(1) *Sáva*, (2) *navani* and (3) *rági*, each with an admixture of *tur*. Season, &c., as above. Outturn 12 annas of the formulæ.
2 0	132	21 1/7	...	*Experiment No. 113.*—Linseed a subordinate crop sown mixed with *jowári* in every sixth row on ordinary black soil growing (1) cotton, (2) wheat and (3) *jowári* with mixtures. Season and tillage good. The seed rate is the actual quantity sown with *jowári* over an acre in every sixth row only and the yield is the actual outturn of an acre. The sample forwarded gave an excess weight of 2 1/2 tolas in this office.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	KOLA'BA.		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. J. H. DuBoulay, Assistant Collector.									
114	Pen (Borgaon) ...	Eleusine coracana (Halvi early Rági), 23rd October 1893.	11	390	5⅔	1,478	...	35 14 1	0 3 6 O. S.	0·61
115	Do. (A'mbeghar) ...	Do. (Garvi late Rági), 1st November 1893.	12	1,000	6½	1,115	...	27 0 11	0 2 6 O. S.	0·58
116	Do. (do.) ...	Panicum miliare (Bhuri or late Vari), 24th October 1893.	16	800	2⅘	812	...	16 15 0	0 2 6 O. S.	0·91
117	Karjat (Karjat) ...	Gram, 7th February 1894.	13	265	91	759	...	23 13 6	5 2 7 R. S.	21·58
	Mr. K. N. Bhángáonkar, District Deputy Collector.									
118	Alibág (Kude) ...	Eleusine coracana (Nágli), 18th October 1893.	18	1,800	...	1,973	80 head-loads.	53 8 8	0 2 6 O. S.	0·29
119	Roha (Chávre) ...	Panicum miliare (Vari), 23rd October 1893.	17	850	...	527	2,164	12 6 0	0 2 6 O. S.	1·26
120	Mángaon (Rile) ...	Gram, 28th February 1894.	15	300	101	353	...	10 2 11	0 12 2 O S.	7·46
	RATNA'GIRI.									
	Mr. G. D. Pánse, Assistant Collector.									
121	Devgad (Mutát) ...	Salt rice (Khára-dodka), 16th November 1893.	12	750	58	909 in husk.	2,986	23 1 10	1 0 9 O. S.	4·52

Southern Division, 1893-94—continued.

R. S.=Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	63	$41\frac{1}{5}$	...	*Experiment No. 114.—Halvi* or early *nágli* on reddish *mál* land growing *nágli* and *vari* for two years after four years' fallow. Seed-bed ($3\frac{1}{3}$ gunthas for an acre of plantation) liberally rábed with cowdung, coarse and fine grass, rubbish and fine earth. Season on the whole fair, though rainfall deficient both at the beginning and at end of the monsoon. Tillage fair. Crop more than maximum according to the formulæ though estimated at 11 annas only.
0 8	Do.	Do.	...	*Experiment No. 115.—Garvi* or late *nágli* on upland *varkas dongri* land growing the same crops under similar conditions. The seed-bed, 2 gunthas for an acre of transplantation, rábed with brushwood, coarse and fine grass, rubbish and earth. Season and tillage as above.
0 8	66	48	...	*Experiment No. 116.—Bhuri* or white *vari* on another part of the above field. Five gunthas of seed-bed, sufficient for an acre of transplantation, rábed with 10 carts brushwood and 7 each of coarse and fine grass and rubbish and 5 carts of earth. Season, &c., as above.
0 8	74	$32\frac{1}{4}$	...	*Experiment No. 117.*—Gram, a second crop, on ordinary *chickan* rice land growing rice every year followed occasionally by a pulse only on a portion of the field. Season good. Seed rate very high. The outturn half as much again as the maximum crop of the formulæ. Incidence calculated on the 2nd crop alone.
0 8	$64\frac{3}{8}$	$39\frac{2}{3}$	21 head-loads.	*Experiment No. 118.—Nágli* after a fallow of three or four years followed by *vari* in the 2nd year. Six gunthas of seed-bed rábed with solid droppings of 22 heads of cattle tied, for two months, on the area of transplantation; 40 head-loads of grass and 7 carts of household refuse also used as ráb material on seed-bed. Season favourable; and tillage good. About $6\frac{1}{2}$ lbs. seed sown on a seed-bed of 6 gunthas. Proportionate area of seed bed to acre of transplantation not reported, therefore acre seed rate unknown. Sample 3 tolas short of the reported weight.
0 8	$65\frac{1}{5}$	$50\frac{1}{7}$	$10\frac{2}{7}$	*Experiment No. 119.—Vari* on land similarly cropped and similarly assessed. Twelve gunthas of seed-bed were rábed with 10 carts of cowdung, 10 of coarse grass, four of fine grass and two of rice husk. Season favourable; and tillage good. The sample forwarded to this office fell short of the recorded weight by 7 tolas. $1\frac{2}{3}$ lbs. seed sown on 12 gunthas. Proportionate area of seed-bed to acre of transplantation not reported, therefore, acre seed rate unknown.
0 10	82	$34\frac{2}{3}$	...	*Experiment No. 120.*—Gram grown continuously on unmanured *malkhandi* land in which water is impounded in the monsoon to prevent growth of grass and to secure moisture for the pulse. Season fair. Reported seed rate apparently very high. Sample received in this office gave an excess of 6 tolas over the reported weight.
0 4	$30\frac{1}{4}$	$43\frac{1}{2}$	$12\frac{1}{5}$	*Experiment No. 121.*—Salt *dodka* rice grown from sprouted seed on unmanured *kháján* land. Season good and tillage fair. Outturn 13 annas according to the formulæ.

O. S. = Original Survey.

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	RATNA'GIRI—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. G. D. Pánse, Assistant Collector —continued.									
122	Devgad (Giren) ...	Rice (Tavasál), 13th November 1893.	12	1,000	120	830 in husk	6,282	26 5 3	7 8 4 O. S.	28·56
123	Rájápur (Kodavli) ...	Paspalum scrobiculatum (Harik), 29th November 1893.	10	250	39	388	...	4 12 4	0 3 1 O. S.	4·04
	Mr. L. C. Crump, Assistant Collector.									
124	Dápoli (Harnai) ...	Rice (Patni), 4th November 1893.	16	2,000	72	1,772 in husk	4,160	53 13 4	9 3 8 O. S.	17·14
125	Do. (do.) ...	Do. (do.) ...	16	2,000	72	2,133 Do.	5,214	64 15 6	8 1 11 O. S.	12·49
126	Do. (Choli) ...	Paspalum scrobiculatum (Harik), 16th November 1893.	17	680	37	942	1,350	14 9 7	0 2 9 O. S.	1·17
127	Do. (do.) ...	Do. (do.) ...	17	680	37	458	800	7 4 1	0 2 0 O. S.	1·72
	Mr. S. S. Kamlápurkar, District Deputy Collector.									
128	Ratnágiri (Shirgaon) ...	Rice (Fine Vánksál), 2nd November 1893.	12	1,000	67	1,170 in husk	2,250	42 0 6	5 12 7 O. S.	13·76
129	Do. (Mirjole) ...	Do. (Coarse Vánksál), 3rd November 1893.	14	1,340	68	1,542 Do.	4,000	57 8 0	4 0 6 O. S.	7·01
130	Sangameshvar (Phansavne).	Eleusine coracana (Nágli, Mahán, Mahádi), 13th November 1893.	14	1,340	11½	1,275	1,050	34 3 10	1 0 1 O. S.	2·93

Southern Division, 1893-94—continued.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices or Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 4	30½	37½	13⅔	*Experiment No. 122.*—Continuous rice, *tavasál*, on kharif *malai* land manured with the ashes of 51 bundles of dry leaves and 31 head-loads of cowdung. Seed artificially germinated and then sown broadcast. Season good; and tillage fair. Seed rate more than double the formulæ. Outturn 10 annas according to the same standard.
0 6	33	81½	...	*Experiment No. 123.*—*Harik* on *bharad varkas* land growing (1) *nágli*, (2) *vari*, (3) *harik* and (4) *til* after three years' fallow. Area of test below the prescribed minimum. Seed rate four times that of the formulæ and outturn 12 annas.
0 4	47	43⅓	2⅔	*Experiment No. 124.*—Continuous rice, *patni*, on unmanured kharif, *pánthal*, land. 10 gunthas of seed-bed, rábed with 30 head-loads of cowdung and 40 of grass, supplied seedlings for an acre of transplantation. Season and tillage both fair. Outturn 14 annas according to the formulæ.
0 4	Do.	Do.	3	*Experiment No. 125.*—Same crop on similar soil bearing a slightly lower assessment, but occupying a more favourable position, being at the foot of a hill from which it benefits by the annual wash. Other conditions as above.
0 8	48	69	12⅔	*Experiment No. 126.*—*Harik*, on fairly flat *bharad varkas* land. The field grows *nágli*, *vari*, *harik*, &c., in rotation, and when exhausted lies fallow for five years. The field rábed for the previous crop. Season favourable; and tillage good. Seed more than treble the formulæ rate and yield full maximum.
0 8	47	67½	15¼	*Experiment No. 127.*—Same crop on a steep stony field. The field, when exhausted after a short rotation of inferior millets, lies fallow for eight years. Other conditions same as above. Outturn 12 annas when compared to the formulæ standard.
0 4	40¾	33⅓	2⅔	*Experiment No. 128.*—Sprouted rice, fine *vánksál*, grown continuously on *kudyat* red kharif, slightly sloping land manured with 60 head-loads of refuse per acre before the rains and with an equal quantity of cowdung at sowing time. Hot weather irrigated rice grown annually on a portion of the field as a second crop. Season fair; but tillage not careful. By-product valued high.
0 4	41¾	34¼	Do.	*Experiment No. 129.*—Continuous rice, coarse *vánksál*, sown broadcast without pre-germination on low-lying, *bávool*, brown alluvial soil, which receives the wash from higher fields all round and which, for the crop, was rábed with 30 head-loads each of cowdung and leaves and 40 bundles of grass per acre burnt over the whole field in March. Season favourable; and cultivation good. Crop full average.
0 8	56½	40½	3⅔	*Experiment No. 130.*—*Nágli*, *mahán*, grown every year without any fallow on red sandy, *umbar pulanvat*, sloping soil situated on the bank of a *nála*; seed sown in seed-bed, 6 gunthas for an acre of field, rábed in March with 25 loads of dried cowdung, 30 loads of tree loppings, 20 loads of grass and 5 of *harik* straw. Season and tillage good.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Táluka, Village and Experimenter.	Crop and Date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.					
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.
						Principal Product	By-product.			
1	2	3	4	5	6	7	8	9	10	11
	RATNA'GIRI—*contd.*		Annas.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.
	Mr. S. S. Kamlápurkar, District Deputy Collector —continued.									
131	Sangameshvar (Dhámni).	Eleusine coracana (Nágli, Mahán, Gunjavali), 14th November 1893.	12	1,000	9½	996	1,100	27 10 3	0 4 0 O. S.	0·90
	KA'NARA.									
	Mr. N. B. Divatia, Assistant Collector.									
132	Ankola (Sunksál) ...	Rice (Kemp bhatta), 9th December 1893.	12	1,500	15⅓	2,745 in husk	6,353	74 1 7	2 12 3 O. S.	3·73
133	Do. (Belikeri) ...	Late rice (Vaingun Chitka), 3rd May 1894.	10 to 12	...	132	977 Do.	2,417	32 5 1	5 3 11 O. S.	16·23
	Mr. C. W. M. Hudson, Assistant Collector.									
134	Kárwár (Kone) ...	Rice (Kempu Pandya), 21st October 1893.	15	1,110	229	2,328 Do.	2,750	63 5 2	5 5 1 O. S.	8·39

Southern Division, 1893-94—concluded.

R. S. = Revision Survey.

Area of Test.	Equivalent in Tolas of local measure Ser.	Prices of Produce per Rupee.		Remarks.
		Principal Product.	By-product.	
12	13	14	15	16
A. g.	Tolas.	Lbs.	Cwts.	
0 8	52½	40⅜	3⅔	*Experiment No. 131.*—Same crop grown under like conditions on similar land assessed at a lower rate. Seedlings from 7⅓ gunthas sufficed for an acre of plantation. Seed-bed rábed as above. Crop slightly diseased which lowered the outturn.
0 6	28½	39½	12⅓	*Experiment No. 132.*—Early rice, *kemp bhatta*, grown continuously on darkish brown soil manured lightly with a compost of cowdung and fresh and dead leaves. The seed-bed was more liberally manured than the field. 9½ gunthas of seed-bed required for an acre of transplantation. Seed rate abnormally low being only 15 pounds per acre. Outturn compared with the formulæ 18 annas.
0 4 3/16	24½	37⅔	3⅔	*Experiment No. 133.—Vaingan* or summer rice, *chitka*, on light brown soil slightly mixed with sand, growing two rice crops every year. 5 tons of compost of cowdung, dry and fresh leaves, and paddy husk, and 2 tons of fish ashes mixed up applied per acre. The crop irrigated from a *nála* passing close by which waters only half the field which alone, therefore, grows the 2nd crop. Season and tillage reported to be good, but the outturn, compared to that obtained last year, considerably less than half. Incidence on the 2nd crop only.
0 4	59⅝	41⅔	3⅔	*Experiment No. 134.*—Rice, *kempu pandya*, on *mannu* sandy soil manured with about 13 cart-loads of compost of ashes, leaves and stable litter and cattle dung per acre. The field grows rice followed by a pulse every year. Soil sandy, but low-lying and receives the wash from adjoining hills on the south. Season fair; cultivation ordinary. Seed rate nearly double the formulæ and the outturn more than double the same standard. Sample weighed 57 tolas in this office.

00133393

Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020